

English



Instructions for Use

HeartStart Intrepid

Monitor/Defibrillator

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Medical Device Directive

The HeartStart Intrepid complies with the requirements of the Medical Device Directive 93/42/EEC.

Conventions Used in This Manual

Images of the HeartStart Intrepid display throughout this manual are for illustration purposes only. Device displays, options, and functions may vary.

This book contains the following conventions:

WARNING: Warning statements alert the reader to a potential serious outcome, adverse event, or safety hazard. Failure to observe a warning may result in death or serious injury to the user or patient.

CAUTION: Caution statements alert the reader to the safe and effective use of the product. Failure to observe a caution may result in minor or moderate personal injury, damage to the product or other property, loss of data, or environmental pollution.

NOTE: Notes contain additional information on usage.

TIP: Tips provide hands-on insight into using this product.

☉ The “bull’s eye” icon indicates a process or a procedure (a set of steps to achieve a certain goal).

“Voice” represents voice instruction

Text or **Text** represents messages that appear on the display

[soft key] represents soft key labels that appear on the display above the button to which they correspond

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Table of Contents

Chapter 1	Introduction	1
Overview		1
Intended Purpose		2
Intended Use		2
Intended Use Population		2
Intended Users		2
Indications for Use and Contraindications		3
Use Environment		6
Safety Considerations		7
Getting Started		7
Chapter 2	Device Basics	9
Overview		9
Front of the Device		9
Right Side.		10
Connecting the Therapy Cable		10
Detaching the Therapy Cable		10
Connecting the Therapy Cable Collar		11
Connecting Multifunction Electrode Pads		11
Installing Printer Paper		12
Left (Monitor) Side		13
Connecting the CO2 Filter Line		13
Connecting the SpO2 Cable		14
Connecting the NBP Cable.		14
Connecting the ECG cable		15
Connecting the Temperature Cable		15
Top Panel		15
External Paddles		16
Accessing Infant Paddles		17
Back Panel		18
Battery and AC Power		18
Installing the Battery		18
Removing the Battery		19
AC Power Cord Guard		19
Tying the Defibrillator Test Plug to the Therapy Cable		20
Connecting the Cable Straps		20

Installing Carry Bags	21
EMS Environment	23
Chapter 3 Operating the Device	25
Operating Modes	25
Continued Use Feature	26
Controls.	27
Therapy Knob and Controls	27
Smart Select Knob	27
General Function Buttons	28
Soft Keys.	28
Ready For Use Indicator	29
Power	29
Lithium Ion Battery	30
Power Indicators	30
Powering the Device On and Off	31
The Display.	32
Status Area	32
Message Area.	33
Waveform Display	33
Menus	35
Parameter Area	35
Entering Patient Information	36
Event Volume and Annotation	36
Changing Volume Levels for the Current Event	36
Mark Events	37
Alarms	37
Alarm Management and Configuration	38
Changing Alarm Limits	41
Responding to Alarms	42
Passwords	43
Service Password	43
Configuration Password	43
Data Management Password	43
Safety Considerations	43
CPR Safety Considerations	45
Chapter 4 ECG Monitoring	47
Overview	47
Intended Use Population	48

Safety Considerations	48
Electrosurgery Considerations	48
Preparing to Monitor ECG	49
Skin Preparation	49
Monitoring ECG Using Multifunction Electrode Pads	50
Monitoring ECG Using Electrodes	50
ECG Electrode Placement	51
3-Lead ECG Electrode Placement	51
5-Lead ECG Electrode Placement	51
Locating the Fourth Intercostal Space	52
12-Lead ECG Electrode Placement	52
Lead Selection Criteria	53
Available Lead Choices	53
Selecting the Waveform	54
Monitor, Manual Defibrillation, and Pacing Modes	54
Dashed Line in ECG Display	55
Changing the ECG Gain of the Primary Lead	55
Displaying an Annotated ECG	56
Arrhythmia Monitoring	56
Arrhythmia Beat Labels.	56
Heart Rate Averaging	57
Aberrantly-Conducted Beats	57
Intermittent Bundle Branch Block	57
Arrhythmia Learning/Relearning	57
Heart Rate and Arrhythmia Alarms	59
Arrhythmia Alarm Precedence	60
Setting Alarms	61
Responding to Alarms	61
Troubleshooting	61
 Chapter 5 AED Mode Option	 63
Overview	63
Smart Analysis Algorithm	63
Intended Use Population	64
Related Information	64
Safety Considerations for AED Therapy	64
AED View	65
AED Soft Keys.	66
Accessing the AED Main Menu.	67
Using AED Mode to Defibrillate.	67
Preparation	67

Table of Contents

Operation	68
AED Mode User Messages	70
Informational Messages	70
Pad Connection Messages.	70
Analysis-Related Messages	72
Shock-Related Messages	72
Using AED Mode to Monitor	73
Configurable Resuscitation Protocols	74
AED Alarms	74
Other Alarms in AED Mode	75
Troubleshooting	75
Chapter 6 Manual Defibrillation and Cardioversion	77
Overview	77
Intended Use Population	77
Safety Considerations	78
Code View	79
Viewing an ECG with External Paddles (Quick Look).	80
Preparing for Defibrillation.	81
Setting Up Multifunction Electrode Pads for Defibrillation.	81
Setting Up External Paddles for Defibrillation	81
Setting Up Infant Paddles for Defibrillation	82
Setting Up Internal Paddles for Defibrillation	82
Defibrillation	83
Select the Defibrillation Energy	83
Charge the Defibrillator	83
Shock the Patient.	84
Synchronized Cardioversion	84
Preparation	85
Code View and Cardioversion	86
Delivering a Synchronized Shock	86
Synchronized Shock with External Paddles	88
Delivering Additional Shocks	88
Turning Sync Off.	88
Manual Defibrillation and Cardioversion Alarms	89
Troubleshooting	89
Chapter 7 Pacing	91
Overview	91
Intended Use Populations.	91

Safety Considerations	92
Pacing View	92
Demand Mode Versus Fixed Mode	93
Preparing for Pacing	93
Demand Mode Pacing	95
Fixed Mode Pacing	96
Defibrillating During Pacing	97
Pacing Alarms	97
Troubleshooting	99

Chapter 8 Monitoring SpO₂ 101

Overview	101
Intended Use Populations	101
Safety Considerations	101
SpO ₂ Measurement Accuracy	102
Understanding Pulse Oximetry	102
Selecting a Sensor	103
Applying the Sensor	103
Monitoring SpO ₂	104
SpO ₂ and Pulse Rate Alarms	105
SpO ₂ Desat Alarm	106
Changing SpO ₂ and Pulse Alarm Limits	107
Enabling/Disabling SpO ₂ and Pulse Alarms	107
Disabling SpO ₂ Monitoring	108
Caring for Sensors	108
Troubleshooting	108

Chapter 9 Monitoring Noninvasive Blood Pressure and Temperature 109

Overview	109
Noninvasive Blood Pressure (NBP) Monitoring	109
Temperature Monitoring	109
Intended Use Populations	110
Safety Considerations for NBP	110
Measuring NBP	111
Assessment of Hypertension	112
NBP Frequency	113
NBP Alarms	113
NBP Calibration	115

Table of Contents

Monitoring Temperature	115
Temperature Alarms	115
Caring for NBP Cuffs and Temperature Cables	117
Troubleshooting	117
 Chapter 10 12-Lead ECG	 119
Overview	119
ECG Measurement Basis and the DXL Algorithm	119
12-Lead ECG Preview Screen	120
Patient Preparation for ECG	122
Acquiring a 12-Lead ECG	122
Improving Signal Quality	123
12-Lead ECG Report	124
Interpretive and Critical Value Statements	125
Accessing Stored Reports	127
Troubleshooting	127
 Chapter 11 Monitoring Carbon Dioxide	 129
Overview	129
Intended Use Population	129
Safety Considerations for Measuring EtCO ₂	130
Preparing to Measure EtCO ₂	131
Selecting the Accessories	132
Using the Cannula	132
Using the Cannula with Airway Adapter	132
Monitoring EtCO ₂	133
EtCO ₂ and AwRR Alarms	134
Changing the EtCO ₂ Alarm Limits	135
Enabling/Disabling the EtCO ₂ Alarms	135
Changing the AwRR Alarm Limits	135
Changing the Apnea Time Alarm Limit	136
Enabling/Disabling AwRR Alarms	136
Zeroing the CO ₂ Module	136
Zeroing Using the Soft Key	137
Zeroing Using the Smart Select Knob	137
Messages Related to Zeroing the CO ₂ Module.	137
EtCO ₂ Accuracy	138
Accuracy in the Presence of Interfering Gases	138
Disabling the EtCO ₂ Monitoring Function	139

Troubleshooting	139
---------------------------	-----

Chapter 12 Traumatic Brain Injury Advisory 141

Overview	141
Intended Use Population	142
Enabling the TBI Advisory	142
Displaying the TBI Advisory	142
TBI for Systolic Blood Pressure (SBP)	142
TBI for EtCO ₂	142
TBI for SpO ₂	143
Disabling TBI Advisory	143
Troubleshooting	143

Chapter 13 Q-CPR 145

Overview	145
CPR meter 2	145
Intended Use Population	146
Safety Considerations for Q-CPR	147
Using the CPR meter 2	147
Connecting the Pads/CPR Therapy Cable	148
Connecting the CPR meter 2 to the Pads/CPR Therapy Cable	148
Connecting Multifunction Electrode Pads	149
Attaching the CPR meter 2 Adhesive Pad	149
Placing the CPR meter 2 on the Patient	150
Performing CPR with the CPR meter 2	151
Understanding the Compression Feedback Indicators	151
Using Q-CPR on the HeartStart Intrepid	152
Using Q-CPR in AED Mode	153
Using Q-CPR in Manual Defibrillation Mode	153
CPR Voice Instructions and Screen Messages	155
Adjusting the Volume of the CPR Voice Instructions.	156
After Each Use	157
Data and Events Recorded	157
Research Storage Setting	157
Q-CPR Alarms.	158
Reviewing Q-CPR Data	158
Troubleshooting	158

Chapter 14 Configuration 159

Overview	159
--------------------	-----

Table of Contents

Entering Configuration Mode	159
Working in Configuration Mode	160
Setting the Date and Time	160
Changing Settings	160
Exporting Settings	161
Importing Settings	162
Printing Configuration Settings	162
Restoring Default Settings	162
Configurable Parameters	163
Date and Time Settings	163
Date/Time Format Settings	163
General Settings	164
Monitoring Settings	165
Therapy Delivery Settings	169
Display Settings	171
Data Management Settings	172
Wi-Fi Configuration	174
Cellular Configuration	175
Certificate Management Configuration	175
Communication Configuration	177

Chapter 15 Data Management 179

Overview	179
Event Summaries.	179
Accessing Data Management Functions	180
Printing an Event Summary Report	181
Accessing Event Summary Data on the USB Drive.	182
Transmitting Event Data in Data Management Mode	183
Removing All Identifying Patient Data	183
Printing During a Patient Event	184
Vital Signs Trends Data.	184
Viewing Trends Data	185
Setting Trend Intervals	185
Printing Trends Data from an Event Summary.	186
Network Connection and Sending Data	186
Network Connection Considerations	186
Troubleshooting	187
Events Stored in an Event Summary	187

Chapter 16 Operational and Shift Checks 197

Shift Check	197
Shift Checklist	197

Accessing the Operational Check Menu	198
Operational Check	199
Performing an Operational Check	199
Operational Check Results and Failures	201
User Checks	205
Weekly Shock Test	205
Alarm Test	206

Chapter 17 Maintenance 207

Overview	207
Automated Tests	208
Automated Test Summaries	208
Battery Maintenance	210
Battery Useful Life	210
Checking the Battery Charge	210
Low Battery Conditions	211
Initializing Batteries	211
Charging Batteries	211
Storing Batteries	211
Discarding Batteries	212
General Battery Safety	212
Power-Related Alarms	213
About Cleaning and Disinfecting the Device and Accessories	213
Supplies for Cleaning and Disinfecting	214
Safety Considerations	214
Cleaning the Device	214
Cleaning the Device Printhead	215
Cleaning Device Accessories	215
Disinfecting the Device and Accessories	216
Service and Care of the Cables and Paddles	216
HeartStart Intrepid Disposal	216
CPR meter 2 and Adhesive Pad Disposal	216

Chapter 18 Supplies and Accessories 217

Approved Supplies and Accessories	218
ECG and Defibrillation Accessories	218
Blood Pressure Air Hoses and Cuffs	218
Cable Management and Accessory Storage	219
Data Management Accessories	219

Table of Contents

Device Mounting Accessories	219
ECG Monitoring Accessories	219
ECG Monitoring Electrodes	219
3-Lead ECG Cable Sets	220
5-Lead ECG Cable and Lead Sets	220
12-Lead ECG Cable and Lead Sets	221
EtCO ₂ Monitoring Accessories.	221
External Multifunction Pads Cables and Adapters	222
External Paddles	222
Internal Paddles.	222
Multifunction Electrode Pads	223
Paper	223
Power Supply Accessories	224
CPR meter 2 Accessories	224
SpO ₂ Cables and Sensors	224
Temperature Monitoring Probes and Cables	225
Test Loads and Shorted Plugs	225

Chapter 19 Troubleshooting 227

Overview	227
Responding to Test Results	227
Device Information.	228
Symptoms	228
Defibrillation and Pacing Problems	229
ECG Problems	231
EtCO ₂ Problems	233
General Problems	235
NBP Problems	237
Power Supply Problems	238
Printing Problems	239
SpO ₂ Problems	240
TBI Advisory Problems	241
Temperature Monitoring Problems	242
USB Problems	242
Servicing the HeartStart Intrepid	243
Calling for Service	243

Chapter 20 Docking Station 245

Docking Station Part List	245
-------------------------------------	-----

Installing the Docking Station on an Ambulance Shelf	246
Removing the Docking Station from an Ambulance Shelf	248
Attaching the Intrepid to the Docking Station	248
Detaching the Intrepid from the Docking Station	251

Chapter 21 Specifications and Safety 253

General	253
Alarms	253
Defibrillator	253
Charge Times	254
Patient Impedance Range	255
Manual Defibrillation Mode	255
AED Mode	255
ECG and Arrhythmia Monitoring	255
Display	257
Battery	257
Temperature	257
Thermal Array Printer	258
Noninvasive Pacing	258
SpO ₂ Pulse Oximetry.	258
EtCO ₂	260
AwRR.	261
NBP	262
Patient Data Storage	262
Environmental	263
Shock	263
CPR meter 2	264
Security and Privacy	264
Security Controls and Access Controls	264
Event Summary Records at Rest and in Transit	265
Device and Access Logs.	265
Physical Security Recommendations.	265
Software Upgrades	265
Device Disposal	266
Safety Regulations	266
REACH Regulation and Device Raw Materials	266
Symbol Definitions	267

Table of Contents

Abbreviation Definitions	272
Electromagnetic Compatibility	273
Federal Communication Commission Interference Statement	274
Reducing Electromagnetic Interference	274
Essential Performance Determinations.	275
Restrictions for Use	275
Emissions and Immunity	275
Guidance and Manufacturer's Declaration.	276
Chapter 22 Index	283

Introduction

The HeartStart Intrepid is designed to meet the advanced requirements of hospital code teams, nurses, physicians, and first-responders in the Emergency Medical Services (EMS) environment.

These *Instructions for Use* provide guidance for the safe and proper operation of the device, including setup, configuration, and maintenance information.

This chapter is divided into the following major sections:

	Overview	p. 1
	Intended Purpose	p. 2
	Use Environment	p. 6
	Safety Considerations	p. 7
	Getting Started	p. 7

Overview

The HeartStart Intrepid is a lightweight, portable monitor/defibrillator with a 21.3 cm (8.4 in) diagonal display. The HeartStart Intrepid can be powered by a rechargeable lithium ion battery and AC/DC power.

The HeartStart Intrepid has four clinical modes of operation: Monitor, Manual Defibrillation/Synchronized Cardioversion, AED, and Pacing.

In clinical modes, the HeartStart Intrepid continually records patient status parameters in an event summary record. An event summary may include vital signs (such as SpO₂, and heart rate), ECG wave data, and therapy events (such as shock delivered). You can use Data Management mode to view and manage event summaries, including printing data using the device printer, transmitting data through a Wi-Fi or cellular network to a defined destination, and exporting data to a supported USB drive.

Various alarms and indicators provide the status of the device and patient. Operational checks and automated tests also help you ensure proper function of the device.

Intended Purpose

Intended Use

The HeartStart Intrepid is intended for use in an EMS or hospital setting by qualified medical personnel trained in the operation of the device and qualified by certified training in basic life support or advanced life support. This HeartStart Intrepid is intended for use in emergency resuscitation as follows:

- In AED mode, to detect a shockable rhythm and deliver a shock.
- In Manual mode, to deliver synchronized and asynchronized defibrillation.
- The optional Q-CPR meter 2 provides user feedback in performing chest compression during CPR.
- In Pacing mode, to deliver external cardiac pacing.
- In Monitor mode, the Intrepid is intended to measure the following items:
 - Heart rate and heart rhythm through ECG
 - Blood oxygen saturation through SpO₂
 - Exhaled CO₂ through EtCO₂
 - Systolic, diastolic, and mean blood pressure through NBP
 - Temperature

Intended Use Population

The HeartStart Intrepid is intended to be used on adults, children, and infants with emergency or life-threatening injuries, acute illnesses, or exacerbations of chronic diseases. Patients may present in the prehospital or in-hospital environment. In-hospital patients may cover a wide range of demographics, disease conditions, and acuity levels.

Intrepid is intended to be used with the following patient populations, as defined by the European Resuscitation Council (ERC) according to Maconochie, I. K., et al (2015).

Table 1 Patient Populations

Patient Population	Description
Newborn	A child just after birth.
Neonate	A child in the first 28 days of life.
Infant	A child under 1 year of age.
Child	A child between 1 and 8 years of age or up to 25 kg (55 lbs) and puberty.
Adult	A patient 8 years old or over 25 kg (55 lbs). Adult guidelines continue to be applied after adolescence.

Intended Users

The primary clinical users for the Intrepid will be qualified medical personnel in a prehospital setting who are trained in the operation of the device and qualified by training in advanced life support (ALS). Prehospital caregivers with Basic Life Support (BLS) training may use the device in AED mode. The Intrepid may also be used by qualified medical personnel in a hospital setting who are also trained in the operation of the device and qualified by training in advanced life support (ALS).

Medical Directors are physicians who provide medical oversight, guidance, leadership and quality assurance to an EMS service. They are responsible for the creation of protocols for patient treatment for paramedics/EMTs and assurance that protocols are followed. Medical Directors are key decision makers in the purchase of clinical equipment with a focus on improving patient outcomes through reliable, quality care.

Non-clinical users include EMS Operations or hospital personnel such as IT support, technicians, biomedical engineers, and service personnel. These users may be responsible for device implementation issues such as integration with IT infrastructure, clinical configuration settings, performance testing and verification, calibration, repairs and routine product maintenance on the monitor/defibrillator device. Other potential responsibilities may include Quality Assurance/Quality Improvement (QA/QI) activities and reporting to the appropriate county, state, or federal agencies.

Indications for Use and Contraindications

Advanced Cardiac Life Support (ACLS) often starts with analyzing the patient's heart rhythms with a manual ALS monitor/defibrillator, such as Intrepid. In contrast to an AED in BLS, where the machine makes the determination as to when to defibrillate (shock) a patient, the user makes those decisions based on rhythms on the monitor and the patient's vital signs. The next steps in ACLS are to provide defibrillation, pacing, insertion of intravenous (IV) lines and placement of various airway devices, such as an endotracheal tube (an advanced airway used in intubations). Commonly used ACLS drugs, such as epinephrine and amiodarone, are then administered between defibrillations in cardiac arrest. Users trained in the operation of the device and qualified by training in basic life support, advanced life support or defibrillation often use the Intrepid in the following modes and indications of use.

AED

When in AED mode, the Intrepid is a semi-automatic defibrillator that uses the patented SMART Analysis AED Algorithm. This software algorithm analyzes the patient's electrocardiographic (ECG) rhythm and indicates whether or not it detects a shockable rhythm. Intrepid in AED mode requires user interaction to defibrillate the patient.

Indications for Use: AED mode is indicated only on patients in cardiopulmonary arrest. The patient must be unconscious, pulseless, and not breathing before using the defibrillator to analyze the patient's ECG.

Contraindications: Intrepid is contraindicated for asynchronous defibrillation in AED mode for patients that are conscious, have a pulse, and are breathing.

Manual Defibrillation Therapy

A direct current defibrillator applies a brief intense pulse of electricity to the cardiac muscle. Intrepid delivers this energy through disposable electrode pads, external paddles, applied to the patient's chest or internal paddles applied to the heart.

Defibrillation is one aspect of the medical care required to resuscitate a patient with a shockable ECG rhythm. Depending on the situation, other supportive measures may include CPR, oxygen administration, and/or drug therapy. Successful resuscitation is related to the length of time between the onset of a heart rhythm that does not circulate the blood (ventricular fibrillation, pulseless ventricular tachycardia) and defibrillation. The AHA and ERC has identified the following links in the chain of survival from cardiac arrest:

- Early access
- Early CPR

- Early defibrillation
- Early advanced life support

The physiological state of the patient may affect the likelihood of successful defibrillation. Thus, failure to resuscitate a patient is not a reliable indicator of Intrepid performance. Patients will often exhibit a muscular response during energy transfer. The absence of such a response is not a reliable indicator of actual energy delivery or device performance.

Unsynchronized defibrillation involves the use of a high-energy shock which is delivered as soon as the shock button is pushed to treat conditions such as ventricular fibrillation and pulseless ventricular tachycardia. Synchronized defibrillation, or cardioversion, involves the delivery of a low energy shock that is timed at a specific point on the QRS complex to avoid inducing ventricular fibrillation. Cardioversion is used to treat cardiac arrhythmias such as atrial fibrillation, atrial flutter, or supraventricular tachycardia when medications have failed to convert the rhythm or when the patient is unstable and the rhythm must be terminated. Intrepid in Manual mode requires user interaction to assess the ECG and decide whether to defibrillate the patient.

Indications for Use: Manual defibrillation in the unsynchronized mode is indicated for terminating certain potentially fatal arrhythmias, such as ventricular fibrillation and symptomatic ventricular tachycardia. Delivery of defibrillation in the synchronized mode is indicated for treating atrial fibrillation, atrial flutter, supraventricular tachycardia, and ventricular tachycardia.

Contraindications: Intrepid is contraindicated for asynchronous defibrillation in manual mode for patients that are conscious, have a pulse, and are breathing or don't have a pulse and are in a non-shockable rhythm, such as asystole or pulseless electrical activity. Intrepid is also contraindicated for synchronous defibrillation in patients that are pulseless and unresponsive with rhythms consistent with ventricular fibrillation, pulseless ventricular tachycardia, asystole or pulseless electrical activity.

Transcutaneous Pacing

Noninvasive pacing in Intrepid delivers an electrical impulse to the heart causing cardiac depolarization and myocardial contraction. The energy is delivered through electrode pads placed on the chest. It is recognized by the AHA and ERC that successful pacing of a patient is related to the length of time between the onset of a brady-dysrhythmia and the initiation of pacing. The physiological state of the patient may affect the likelihood of successful pacing or skeletal muscle activity. The failure to successfully pace a patient is not a reliable indicator of pacemaker performance. The patient's muscular response to pacing is also not a reliable indicator of energy delivered. Intrepid in Pacing mode requires user interaction to set the mA, rate, and start pacing the patient.

- **Indications of Use:** Noninvasive transcutaneous pacing is indicated for hemodynamically unstable bradycardia in patients with a pulse that are unresponsive to atropine.
- **Contraindications:** Intrepid is contraindicated for prolonged brady-asystolic cardiac arrest.

Q-CPR Feedback

Proper CPR involves these aspects:

- Consistently delivering chest compressions at the correct depth and rate
- Completely releasing each chest compression
- Ventilating at the correct rate

Indications for Use: Q-CPR is indicated to provide feedback to encourage rescuers to perform resuscitation in accordance with AHA/ERC guidelines for chest compression rate, depth, and duty cycle and ventilation rate, volume and flow rate (inflation time).

Contraindications: The Q-CPR option is contraindicated for use on neonatal and pediatric patients (under 8 years of age or weighing less than 25 kg) and is not for use when CPR is contraindicated.

ECG Monitoring

The electrocardiogram (ECG) is a recording of the electrical activity of the heart. ECG monitoring allows for the identification and interpretation of cardiac rhythms or dysrhythmias and the calculation of heart rate. ECG on Intrepid is obtained by placing electrodes or pads/paddles on the patient and allows the heart's electrical activity to be monitored and recorded. Intrepid in Monitoring mode requires user interaction to assess the patient's ECG.

Indications for Use: Intrepid is indicated for monitoring and recording 3-5 and 12 lead ECG waveforms and heart rate in patients with and without cardiac dysfunction.

Contraindications: There are no known contraindications for ECG monitoring.

Pulse Oximetry (SpO₂) Monitoring

Pulse oximetry is a noninvasive method that checks the saturation of oxygen in the arterial blood. The pulse oximetry functionality in Intrepid uses an optical sensor that detects light through the patient's finger and then measures the received light with a detector. The received light is translated into a saturation percentage and is displayed as a SpO₂ reading. Intrepid in Monitoring mode requires user interaction to assess the patient's SpO₂.

Indications for Use: Pulse oximetry is indicated for any patient who is at risk for developing hypoxemia.

Contraindications: There are no known contraindications for SpO₂ monitoring.

Noninvasive Blood Pressure Monitoring

Intrepid measures the blood pressure of patients by automatically inflation of an occluding cuff and, using oscillometer measurement technique determines systolic, diastolic, mean arterial pressures and pulse. The measurement can be initiated manually or set to recur at a predetermined interval. Intrepid in Monitoring mode requires user interaction to assess the patient's NBP.

Indications for Use: Noninvasive blood pressure is indicated for detection of trends in hypertension and hypotension. These include patient conditions indicated by abnormalities in physiological parameters such as shock, perfusion during dysrhythmias, responses to fluid therapy, and titration of vasoactive and cardiotoxic medications, and post-defibrillation recovery.

Contraindications for Use: There are no known contraindications for NBP monitoring.

End-tidal CO₂ (EtCO₂) Monitoring

The EtCO₂ functionality in Intrepid is a capnometric device that uses non-dispersive infrared spectroscopy to continuously measure the amount of carbon dioxide (CO₂) during each breath and report the amount present at the end of exhalation. The sample is obtained by side stream method and can be used with intubated and non-intubated patients. Respiration rate is also measured and displayed in breaths per minute. The Intrepid in Monitoring mode requires user interaction to assess the patient's EtCO₂.

Indications for Use: EtCO₂ monitoring is indicated for the detection of trends in the level of expired CO₂. It is used for monitoring breathing efficacy and treatment effectiveness in acute cardiopulmonary care such as to determine the adequacy of chest compressions during CPR, to detect endotracheal tube placement, and endotracheal tube misplacement.

Contraindications for Use: There are no known contraindications for EtCO₂ monitoring.

Temperature Monitoring

Body temperature monitoring is a noninvasive method to measure and record a patient's temperature. Temperature monitoring on Intrepid requires a probe be placed on the skin, inserted rectally, or through the esophagus as users should be acutely aware of patients' temperature because it serves as a useful indicator of change in their clinical condition.

Indications for Use: Temperature is indicated to obtain a baseline temperature to enable comparisons to be made with future recordings to enable close observation in resolving hypothermia/hyperthermia; to observe and monitor patients for changes indicating an infection; to monitor the effect of treatment for antimicrobial therapy for infection.

Contraindications: There are no contraindications for temperature monitoring

Use Environment

The HeartStart Intrepid monitor/defibrillator is used primarily by ALS-trained EMS providers, such as EMTs, paramedics, and emergency physicians in the prehospital environment. This is a challenging environment where providers must provide assessment and treatment to a wide range of patient demographics, disease states and acuities in a highly stressful emergent situation. EMS users need tools to support standards of care that are influenced by the latest clinical evidence, accepted guidelines and local protocols. As such, clinicians need a device which provides a wide range of capabilities to help insure accurate diagnosis and continuous assessment of a patient's condition.

EMS users must also be assured their equipment will perform reliably and effectively in all weather conditions and in all locations where an emergency may occur. The equipment must be designed to withstand the environment not only during clinical use but also during long-term storage and transportation in a variety of vehicles including ambulances, fire apparatus, police vehicles, marine vessels and military vehicles.

The secondary use environment for Intrepid will be in the hospital, primarily for high acuity areas and patient transport. Key requirements for this use model include small size and weight, flexibility to configure the device to adjust to a wide range of patient acuity levels, and interoperability with other data systems.

Safety Considerations

General warnings and cautions that apply to the use of the HeartStart Intrepid are provided in “[Safety Considerations](#)” on page 43. Additional warnings and cautions specific to a particular feature are provided in the appropriate sections of these instructions.

WARNINGS: The HeartStart Intrepid is not intended to be deployed in settings or situations that promote use by untrained personnel. Operation by untrained personnel can result in injury or death.

Use the HeartStart Intrepid on one patient at a time.

Do not attempt to open the device. Electric shock hazards exist internally. Refer servicing to qualified personnel.

Do not service the device while in use with a patient.

Do not modify the device or its supported accessories.

Use only supplies and accessories approved for use with the HeartStart Intrepid. Non-approved supplies can affect performance, results, or protection of the device of a defibrillator discharge.

Use single-use supplies and accessories only once.

Getting Started

The HeartStart Intrepid comes from the factory ready to use. However, before putting the device into clinical use for the first time, it is recommended to perform the following tasks:

- Read these *Instructions for Use* in its entirety.
- Fully charge the battery. For more information, see “[Power](#)” on page 29.
- Run an operational check. For more information, see “[Operational Check](#)” on page 199.
- Perform a shift check. For more information, see “[Shift Check](#)” on page 197.
- Perform a shock test. For more information, see “[Weekly Shock Test](#)” on page 205.

WARNING: Ensure that you understand and follow instructions on the use of the device before using on a patient, including functions, terminology, and abbreviations described in these Instructions for Use. Failure to do so may cause patient harm or death.

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no vertical margin lines or other markings present.

Device Basics

This chapter describes external features and includes general power, printer, and connection information. Some HeartStart Intrepid functions and accessories are optional and may not be applicable to your device setup and configuration.

Overview

Philips pioneered 1-2-3 defibrillation to defibrillate a patient and save a life quickly and easily. Display information is designed to present key information for the current task.

Front of the Device

The front of the device contains operational controls and indicators.

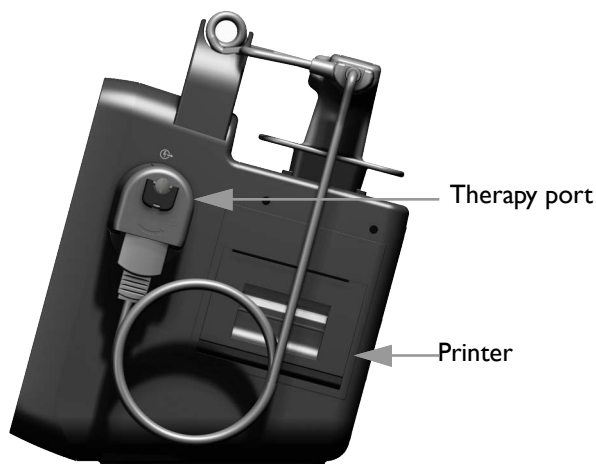
Figure 1 **Front of the HeartStart Intrepid**



Right Side

The right side of the HeartStart Intrepid contains the Therapy port and printer. The Therapy port is used to connect external paddles, internal paddles, or a therapy cable for use with multifunction electrode pads and the optional CPR meter 2.

Figure 2 **Right Side - Therapy Port and Printer**



Connecting the Therapy Cable

© To connect the Therapy Cable:

- 1 Align the white pointer on the cable with the white arrow on the green Therapy port.

Figure 3 **Connecting the Therapy Cable**



- 2 Insert the cable into the green Therapy port and push until it clicks into place. Confirm the connection by gently tugging on the cable to make sure it does not come loose.
- 3 Attach and lock the collar lid.

Detaching the Therapy Cable

© To detach the Therapy Cable:

- 1 Unlock and detach the collar lid. See [“Connecting the Cable Straps”](#) on page 20.
- 2 Rotate the green knob in a clockwise direction as indicated by the unlock symbol  next to the Therapy port.
- 3 Pull the cable away from the device.

Connecting the Therapy Cable Collar

Philips strongly recommends that the HeartStart Intrepid be fitted with the therapy cable collar before being placed into service. The collar adds an extra level of security to prevent excessive wear and vibration with the Therapy port. The collar base comes installed from the factory.

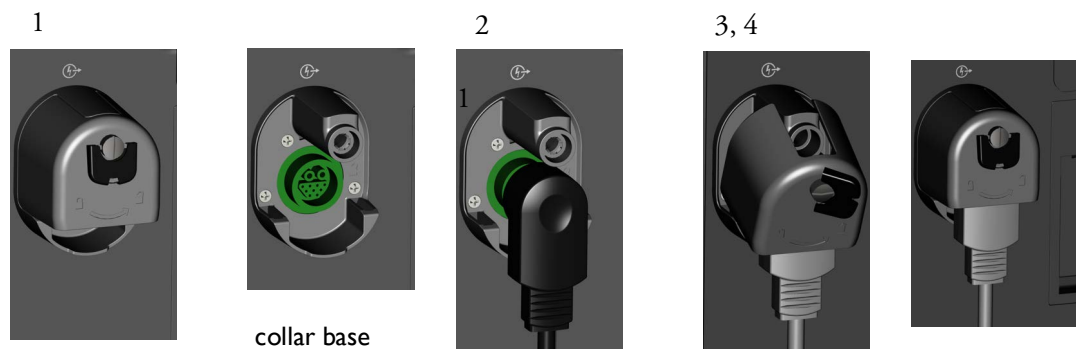
WARNINGS: If using the HeartStart Intrepid in a transport or high-vibration environment without the Therapy Cable fully installed, the device is susceptible to premature Therapy port and cable wear and potential failure, which may result in a delay in therapy.

Do not leave the Therapy Collar base installed without the lid in place. The exposed metal pole could get caught on cables or users' clothing and potentially cause injury.

☉ **To connect the Therapy Cable and install the collar lid:**

- 1 Remove the collar lid if attached.
- 2 Plug the Therapy cable into the green connector port.
- 3 Slide the feet of the collar lid into the grooves on the collar base and push the top of the lid into place.
- 4 Grasp the locking key and push it in while turning it clockwise until the key locks into place.
- 5 To remove the cover, lift up on the lid latch and turn counter clockwise. After the key unlocks, lift the lid out of place. Use a flat-head screwdriver to engage and disengage the cover.

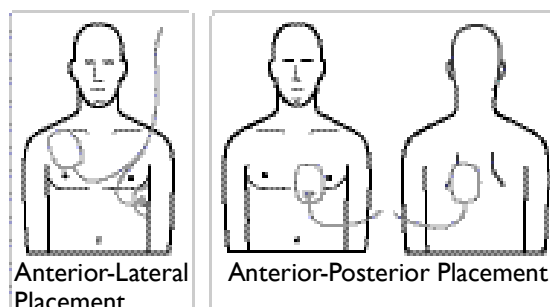
Figure 4 **Locking the Collar Lid**



Connecting Multifunction Electrode Pads

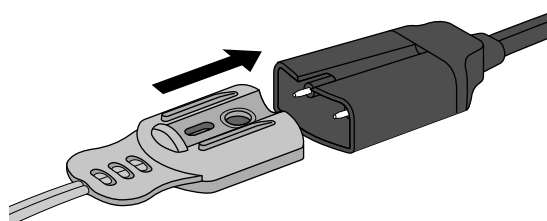
Use multifunction electrode pads to monitor and administer therapy to patients with the HeartStart Intrepid.

Figure 5 **Multifunction Electrode Pad Placement**



- © To connect multifunction electrode pads:
- 1 Ensure that the Therapy cable is connected to the HeartStart Intrepid. See [“Connecting the Therapy Cable”](#) on page 10.
 - 2 Insert the multifunction electrode pads connector into the end of the Therapy cable. See [Figure 6](#).
 - 3 Ensure that the multifunction electrode pads are not expired and that the package is not damaged.
Discard expired or damaged multifunction electrode pads.
 - 4 Remove the multifunction electrode pads from their packaging.

Figure 6 **Connecting Multifunction Electrode Pads**



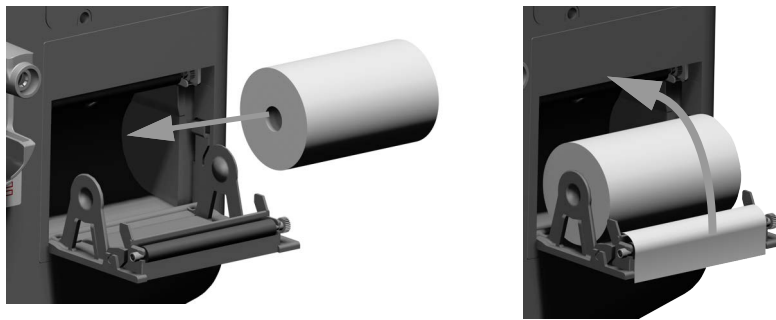
Installing Printer Paper

The HeartStart Intrepid uses 75 mm paper for printing.

CAUTIONS: Printer paper may jam if not installed properly or if the paper is wet.

Thermal printer may be damaged if wet paper is allowed to dry while in contact with printer elements.

- © To install printer paper:
- 1 Open the printer door by pulling up on the door latch. Allow the door to fall open; see [Figure 7](#).
 - 2 If there is an empty or almost empty paper roll in the printer, pull up on the roll to remove it.
 - 3 Examine the new roll of printer paper and remove any remaining adhesive residue from the outer layer of paper.
 - 4 Place the new roll of paper in the paper well, positioning the roll so that the loose end of the roll is on the bottom.
 - 5 Pull the end of the paper out past the roller.
 - 6 Close the printer door. Make sure it clicks in place.
 - 7 Test the printer before putting the defibrillator back into service. See [“Operational and Shift Checks”](#) on page 197.

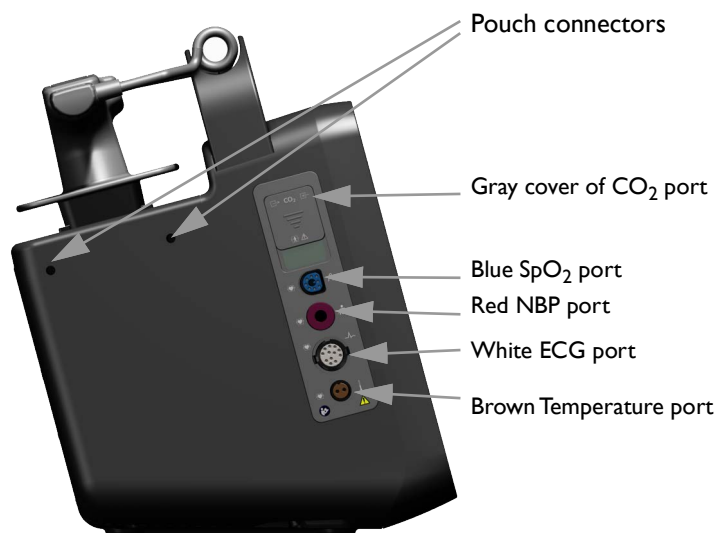
Figure 7 **Installing Printer Paper**

☉ To avoid paper jams:

- 1 Remove the used paper roll.
- 2 Clean the printer roller with alcohol.
- 3 Use pressurized air to remove paper dust.
- 4 Insert the new paper roll.

Left (Monitor) Side

The left side of the HeartStart Intrepid is dedicated to monitoring vital signs. It has ports for ECG, SpO₂, CO₂, NBP, and temperature.

Figure 8 **Monitoring Side**

Connecting the CO₂ Filter Line

Depending on user needs and available accessories set, the CO₂ airway assembly may contain cannulas, adapters, dehumidification tubes, and extension lines. See [“Preparing to Measure EtCO₂”](#) on page 131.

☉ To connect the CO₂ filter line:

- 1 Slide the cover of the CO₂ port down.
- 2 Insert the fitting into the CO₂ Inlet port closest to the front of the device.

- 3 Turn the fitting clockwise until it is tightly and firmly in place.
- 4 Confirm that the filter line is properly connected to the device. A loose connection may result in inaccurate readings.

Figure 9 **Connecting the CO₂ Filter Line**



Connecting the SpO₂ Cable

- © To connect the SpO₂ cable:
- 1 Hold the cable connector with the flat side and blue marking facing the front of the HeartStart Intrepid.
 - 2 Insert the cable into the blue SpO₂ port and push the blue portion of the connector into the device until it is no longer visible.

Figure 10 **Connecting the SpO₂ Cable**



Connecting the NBP Cable

- © To connect the NBP cable:
- 1 Insert the NBP cable into the red NBP port.
 - 2 Attach the NBP cable to the NBP cuff.

Figure 11 **Connecting the NBP Cable**



Connecting the ECG cable

- ☉ To connect a 3-, 5-, or 10-Lead cable:
 - 1 Align the ECG cable with the white ECG port. The white key marker on the ECG cable faces the top of the device.
 - 2 Insert the ECG cable into the ECG port.

Figure 12 **Connecting the ECG cable**



Connecting the Temperature Cable

- ☉ To connect the temperature cable:
 - 1 Insert the Temperature cable into the brown Temperature port.
 - 2 Insert the appropriate probe into the end of the cable.

Figure 13 **Connecting the Temperature Cable**



Top Panel

The top of the HeartStart Intrepid has a handle for easy transport, and, if optional external paddles are present, they reside in the paddle tray on the top of the device.

Figure 14 **Top Panel**



External Paddles

The HeartStart Intrepid has two options for external paddles: part numbers 989803196431 and M3543A, as shown in [Figure 15](#) and [Figure 16](#). While the paddle sets look slightly different, they function the same in a clinical environment.

For patients 10 kg (22 lb) or over, use the external paddles with the adult electrode clip attached. For patients less than 10 kg (22 lb), remove the adult electrode clip from the external paddles to use the infant paddles.

Both paddles in each set have orange shock buttons that flash when the defibrillator is charged. Press both orange buttons simultaneously to administer a shock.

Each sternum paddle contains a Patient Contact Indicator (PCI) with PCI icons  :

- A green PCI indicates proper patient contact.
- A red or orange PCI indicates poor patient contact. Adjust the external paddle placement or pressure until the PCI turns green.

Figure 15 989803196431 External Paddles

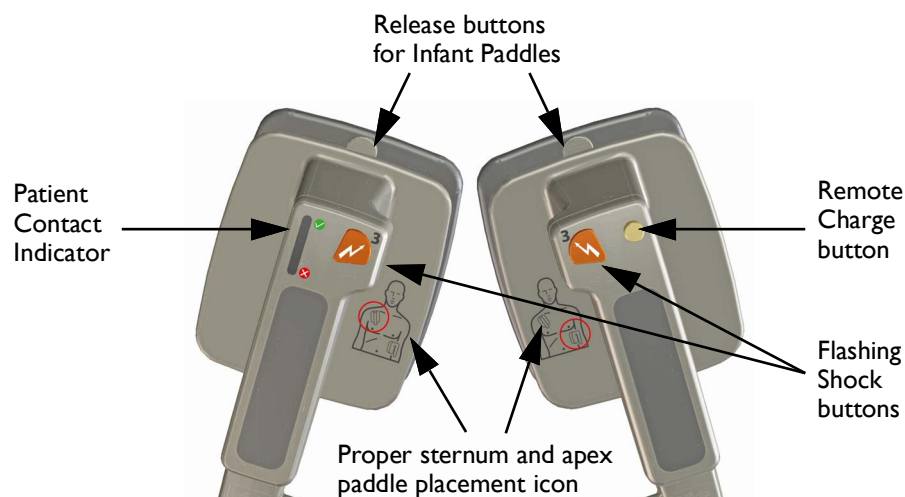
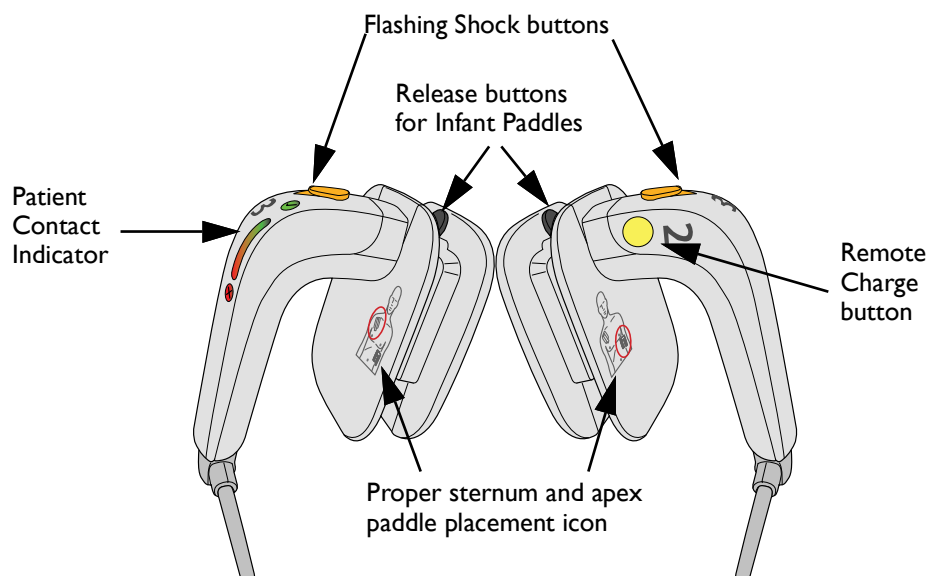


Figure 16 M3543A External Paddles



Accessing Infant Paddles

Accessing the Infant Paddles is the same on both the M3543A and 989803196431 external paddle sets.

WARNING: Make sure the defibrillator is not charged before accessing the infant paddles.

- © To access the infant paddles:
- 1 Press down on the release buttons located on the front of the external paddles.
 - 2 Slide the adult electrode clip off and away from the paddle exposing the infant paddles.

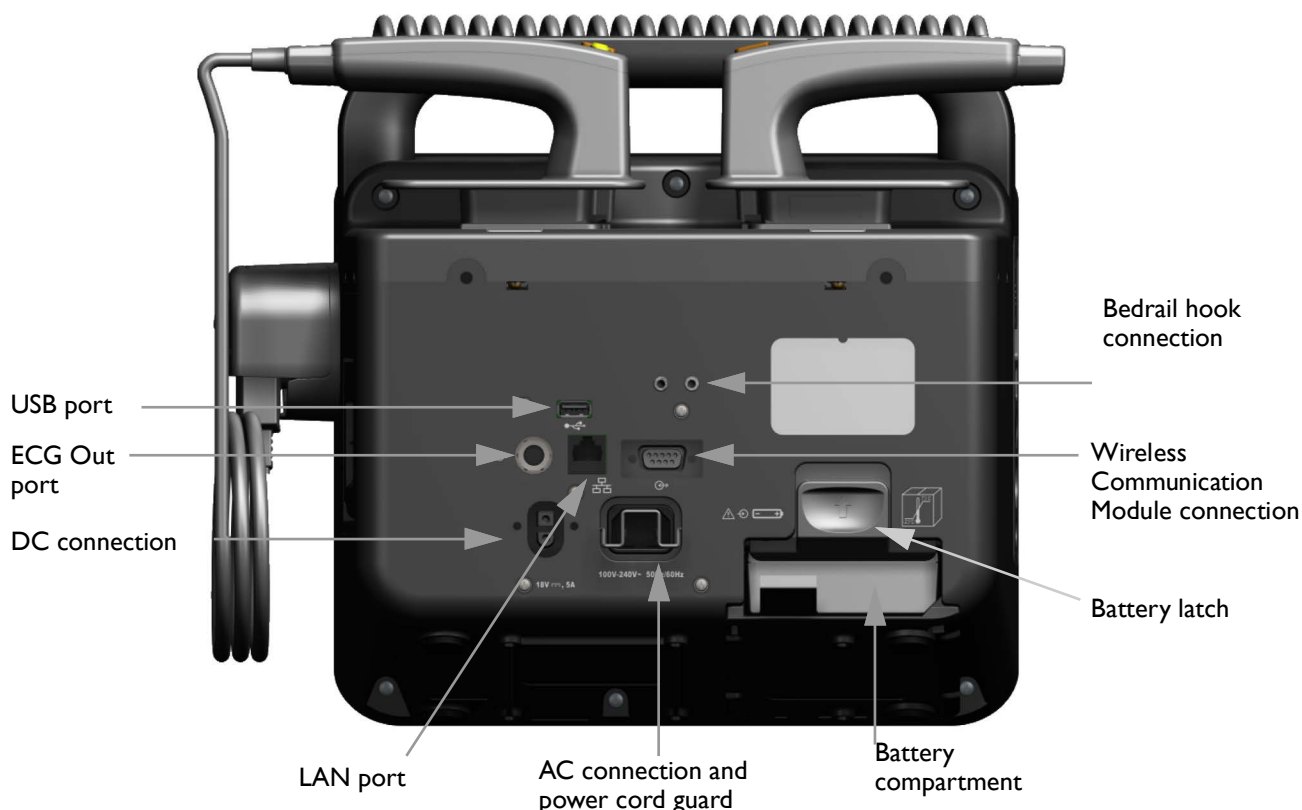
Figure 17 **Infant Paddles**



Back Panel

The back panel of the HeartStart Intrepid has a compartment for the lithium ion battery. It also contains the AC and DC power connections, Wireless Communication Module connector, ECG Out port, and the USB port.

Figure 18 **Back Panel**



WARNING: Do not connect a LAN cable to the HeartStart Intrepid. The LAN port is for factory use only.

Battery and AC Power

The following sections describe how to install a battery and connect to AC power. For additional power-related information, see [“Power”](#) on page 29.

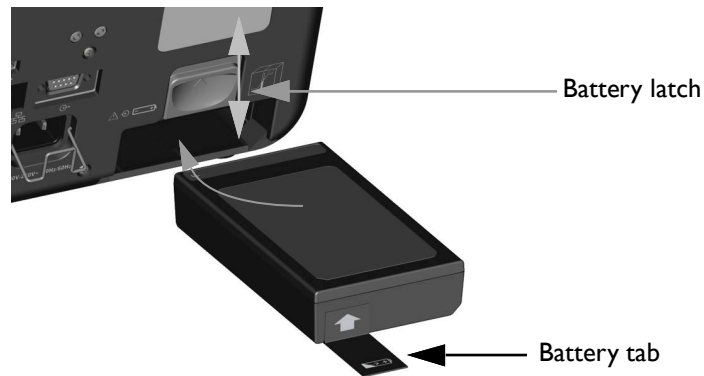
Installing the Battery

WARNING: Only trained personnel should install the battery. An improperly inserted battery could create hazards, such as excessive battery temperature, fire, or explosion.

☉ To install the lithium ion battery:

- 1 Align the battery in the battery compartment. Confirm that the arrow on the battery tab is positioned at the bottom.
- 2 Lift the latch while pushing the battery into the battery compartment. The battery latch locks when the battery is fully inserted.

Figure 19 **Installing the Battery**



Removing the Battery

☉ To remove the HeartStart Intrepid lithium ion battery:

- 1 Push the battery latch up.
- 2 The battery will eject out of the compartment. If it does not, pull on the battery tab to completely remove the battery.

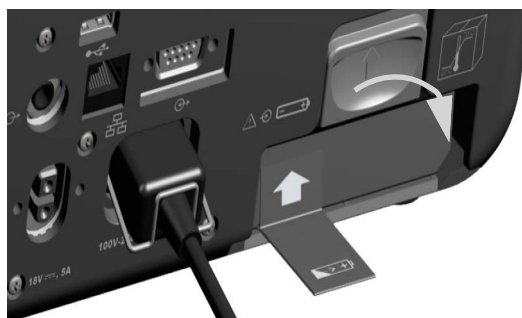
AC Power Cord Guard

The AC power cord guard helps prevent the power cord from disconnecting from the HeartStart Intrepid.

☉ To put the power cord guard in proper position:

- 1 Plug the AC power cord into the AC connection on the back of the device. Push it firmly into place.
- 2 Lower the power cord guard into place, confirming it catches on the back of the AC power cord.
- 3 Confirm a secure fit by lightly tugging on the cord.

Figure 20 **AC Power Cord Guard**



Tying the Defibrillator Test Plug to the Therapy Cable

The HeartStart Intrepid includes a defibrillator test plug to assist in performing a weekly shock test.

To help prevent losing the test plug:

- Using the included tie, attach the test plug about 50 cm (18 in) from the end of the therapy cable, tight enough to prevent the test plug from sliding along the cable.
- Position the test plug so that it can be inserted easily into the therapy cable when the therapy cable is stowed.

Connecting the Cable Straps

To aid with cable management, straps can be snapped on to the side of the HeartStart Intrepid instead of carry bags.

Figure 21 **Cable Straps: Right and Rear View**



Figure 22 **Cable Straps: Left and Front View**



Installing Carry Bags

To install the HeartStart Intrepid carry bags, use a Phillips-head screwdriver.

© To install the carry bags

- 1 Place the device in the pouch assembly.
- 2 Feed the long strap from the right side through the loop on the left side.

Figure 23 **Step 2**



- 3 Pull the long strap tight and fold it down, pressing the hook-and-loop fasteners together.

Figure 24 **Step 3**

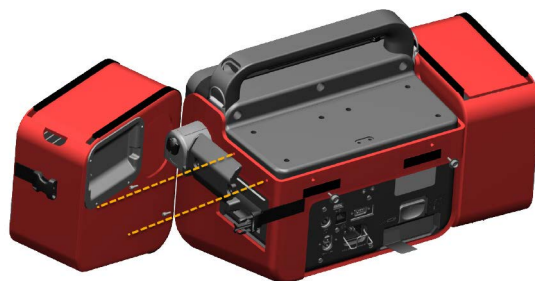


- 4 Screw two snap studs through the holes in the rear of the pouch and into the holes in the rear of the device.

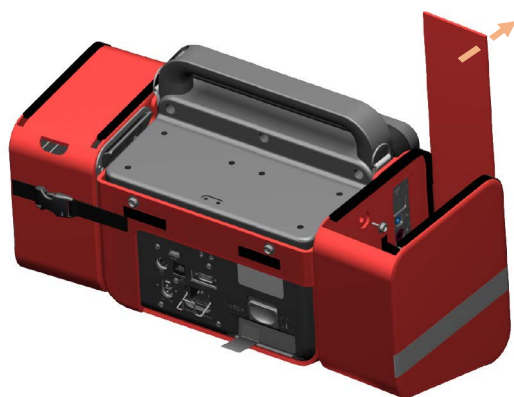
Figure 25 **Step 4**



- 5 Unsnap the rear buckle and swing out the right side pouch. Install two screws through the plastic paper guide and into the holes in the right side of the device. Re-snap the rear buckle. The plastic guide must match the plastic on the right side of the pouch.

Figure 26 **Step 5**

- 6** Open the left side pouch. Using a short screwdriver, screw a snap stud through the hole in the inside wall of the pouch, into the hole in the left side of the device. Close the left side pouch.

Figure 27 **Step 6**

- 7** Push the rear pouch onto the snap studs and hook-and-loop fasteners on the back of the device.

Figure 28 **Step 7**

- 8** Connect the shoulder strap to the loops at each end of the handle.

NOTE: When snapping the therapy/printer side bag in place, confirm that the printer paper path is clear so the strip can come out of the printer freely.

EMS Environment

Using the HeartStart Intrepid in the EMS environment can put stresses on the device and its accessories that could potentially affect essential performance. Be aware of the following:

- Philips recommends the use of the HeartStart Intrepid carry bag to protect the device from drops and bumps.
- Direct sunlight and other sources of excessive illumination can affect SpO₂ readings. For more information, see [“SpO2 Measurement Accuracy”](#) on page 102.
- The device has been built to withstand lint and dust. Thoroughly clean the HeartStart Intrepid after an event where it was exposed to lint and dust. For more information, see [“About Cleaning and Disinfecting the Device and Accessories”](#) on page 213.
- Make sure the ambient temperature is within the acceptable range. For more information, see [“Temperature”](#) on page 257.
- Cellular telephones, 2-way radios and other radio frequency-emitting devices could cause interference problems and potentially affect the behavior of the device.
- Check all accessories frequently. Confirm that all sensors, electrodes, ports and the Therapy cable are in working order. Replace all that are not in good working order.
- Make sure that the Therapy Cable Collar is installed on devices in high-vibration environments. For more information, see the [“Connecting the Cable Straps”](#) on page 20.

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no vertical margin lines or other markings present.

Operating the Device

This chapter is divided into the following major sections:

	Operating Modes	p. 25
	Continued Use Feature	p. 26
	Controls	p. 27
	Ready For Use Indicator	p. 29
	Power	p. 29
	The Display	p. 32
	Entering Patient Information	p. 36
	Event Volume and Annotation	p. 36
	Alarms	p. 37
	Passwords	p. 43
	Safety Considerations	p. 43

Operating Modes

The HeartStart Intrepid has four clinical modes and three non-clinical modes of operation, each with a customized display.

Clinical modes are used by qualified medical personnel, such as nurses, physicians, and paramedics. Non-clinical modes may be used by clinical and non-clinical personnel as appropriate, consistent with the device's intended users.

Table 2 Clinical Operating Modes

Mode	Description	Additional Information
Monitor	Use to monitor ECG, optional SpO ₂ , NBP, temperature, and EtCO ₂ parameters and for viewing trends data.	“ECG Monitoring” on page 47; “Monitoring SpO₂” on page 101; “Monitoring Noninvasive Blood Pressure and Temperature” on page 109, “Monitoring Carbon Dioxide” on page 129, “Printing During a Patient Event” on page 184, and “12-Lead ECG” on page 119
AED	Use to analyze ECG and, if necessary, administer semi-automated external defibrillation, or monitor HR, EtCO ₂ , and SpO ₂ .	“AED Mode Option” on page 63

Table 2 **Clinical Operating Modes (Continued)**

Mode	Description	Additional Information
Manual Defibrillation	Use to perform asynchronous cardioversion (defibrillation).	“Manual Defibrillation and Cardioversion” on page 77
Pacer	Use to perform demand or fixed pacing.	“Pacing” on page 91

Table 3 **Non-Clinical Operating Modes**

Mode	Description	Additional Information
Data Management	Use to view and manage event summaries and other device data after clinical use.	“Data Management” on page 179
Configuration	Use to view and change configuration options.	“Configuration” on page 159
Service	Used by qualified service personnel to service the device, including software upgrades. Service mode is used to initialize and reset a password.	The HeartStart Intrepid <i>Service Manual</i>

Continued Use Feature

When in a clinical mode, the Continued Use feature is activated. This feature facilitates continued treatment of the same patient by retaining the current settings and patient record when the HeartStart Intrepid is turned off for less than 10 seconds. This could occur when turning the knob from Monitor mode to AED mode or when the Therapy knob is accidentally moved to the Off position. If the HeartStart Intrepid is turned back on within 10 seconds, it retains the most recent:

- Alarm settings and conditions
- Wave sector settings
- Event timer
- Volume settings
- Trends data for vital signs
- Pacing settings
- Synchronized cardioversion settings
- SpO₂ value
- EtCO₂ value
- AwRR value
- NBP value and measurement frequency
- Temperature value
- Event summary

NOTES: The Sync feature remains active if the HeartStart Intrepid is turned off for less than 10 seconds. However, Sync is disabled when AED mode is activated and must be turned back on upon returning to Manual Defibrillation mode.

Pacing stops when Pacer mode is exited. It must be restarted manually. Patient settings are retained upon return to Pacer mode.

The Continued Use feature does not function if both battery and external AC/DC power are removed from the device, even briefly.

Controls

Operating controls are organized by function with the soft keys directly beneath the display, defibrillation controls beneath the soft keys, and general function buttons to the left and right of the display. To reach the controls and operate the device, stand within one meter (three feet) of the device.

Therapy Knob and Controls

Use the Therapy knob to select AED mode, Pacer mode, Monitor mode, or an energy for manual defibrillation to deliver defibrillation or cardioversion. Depending on your device configuration, the pacing and AED functions may not be included.

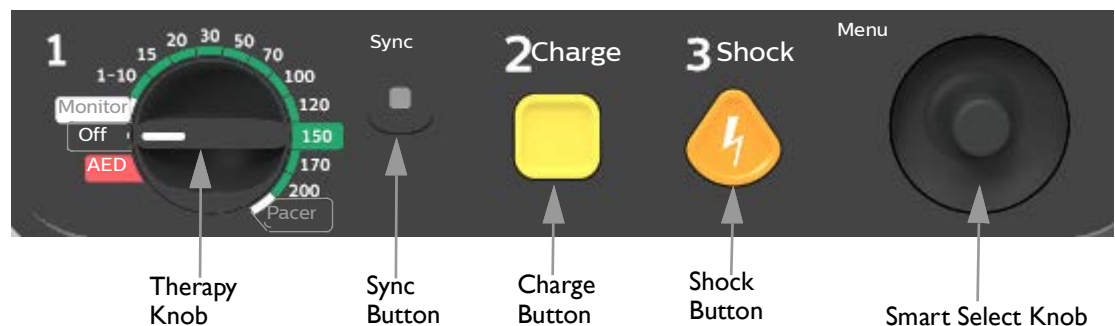
Regardless of the options, the Therapy knob and controls function the same:

- **Turning the HeartStart Intrepid on.** Turn the Therapy knob clockwise for Monitor mode, Manual Defibrillation, or Pacer; turn counterclockwise for AED mode.
- **Charge button.** Charges the defibrillator to the selected manual defibrillation energy setting. It is used only in Manual Defibrillation mode. The defibrillator charges automatically in AED mode.
- **Shock button.** Delivers a shock through multifunction electrode pads or internal paddles. In Manual Defibrillation mode, the shock is delivered at the selected energy. In AED mode, the factory default is 150 joules for the Adult patient category and 50 joules for the Infant/Child patient category. The button flashes when charged.

NOTE: When using external paddles, or switched internal paddles that have Shock buttons, the HeartStart Intrepid delivers a shock by pressing the Shock button(s) located on the paddles. When using switchless internal paddles, the shock is delivered by pressing the Shock button on the HeartStart Intrepid.

- **Sync button.** Toggles between synchronized energy delivery used during cardioversion and asynchronous energy delivery used during defibrillation. The Sync button lights blue when Sync is active.

Figure 29 Therapy Controls



Smart Select Knob

Use the Smart Select knob to navigate to and select various menu and display items:

- **Press the Smart Select knob.** If there is not a menu on the display, the Main Menu is displayed. If there is a menu on the screen, then the highlighted entry is selected.

- **Turn the Smart Select knob.** Turn the Smart Select knob clockwise to scroll down a menu's list or counter clockwise to scroll up the list. The scroll skips over any unavailable entries in the menu. If a numeric selection window is open, turn the knob clockwise to increase the numerical value and counter clockwise to decrease the value.

General Function Buttons

The General Function buttons control monitoring or non-critical resuscitation activity.

Table 4 **General Function Buttons**

Function	Button	Description
Patient Category		Changes the patient category: • Adult patient category. Patients 25 kg (55 lb) or over or those 8 years old or over. • Infant/Child patient category: Patients less than 25 kg (55 lb) or under 8 years old.
Lead Select		Changes the ECG lead in wave sector 1. Pressing this button cycles through the available ECG waves, changing the displayed wave and label. The list of available ECG waves is based on the connected lead set and the device configuration, including pads, if the corresponding cable is connected.
ECG Gain (height)		Pressing the button increases the ECG waveform vertical scale of the primary lead by one setting. If the ECG size is 4-x when the button is pressed, the ECG waveform vertical scale of the primary lead is set to 1/4-x.
Mark Event		Inserts a time-stamped annotation in the event summary to note events as they occur, including the administration of certain drugs. See “Mark Events” on page 37.
Print		Begins a continuous printout of the primary ECG and other selected waveforms either in real time or with a 10-second delay, depending upon the configuration. The strip prints the primary ECG lead and a second wave with event annotations and measurements. This strip prints a third wave from wave sector 3 or 4. Pressing the Print button while printing is in progress stops the printing.
Alarms		When pressed, pauses all audible physiological and technical alarms for the configured time interval. At the end of the pause interval, each alarm returns to its previous setting. Pressing the Alarms button during the pause interval returns the alarms to their previous setting. In AED mode, this button is used for “Alarms Off”.

Soft Keys

The soft keys perform the function displayed directly above it on the display. The display and function change for the various modes of operation. Functionality of the soft keys are described in their appropriate chapters throughout these *Instructions for Use*.

Ready For Use Indicator

The Ready For Use (RFU) Indicator is located in the upper right section on the front of the device. It indicates the status of the therapy delivery functions.

Table 5 RFU Indicator

Indicator Appearance	Device Status
 Blinking green	Indicates that shock, pacing, and ECG functions of the device are ready for use. Sufficient battery power is available for device operation.
 Blinking red with periodic audio chirp	Indicates either: • A low battery condition exists, and the battery is not charging. • There is no battery installed, and the device is running on AC/DC power only.
 Blinking red with no audio chirp	Indicates a low battery power condition but the battery is currently charging. The device can be used but its battery-only operation time is limited.
 Solid red with periodic audio chirp	Indicates that a critical failure has been detected and may prevent the delivery of defibrillation therapy, pacing, or ECG acquisition.
 Solid red with no audio chirp	Indicates no power available or the device cannot power on.

Power

The HeartStart Intrepid is powered by a lithium ion battery or AC/DC power:

- When pacing, to prevent the battery from eventually becoming depleted and interrupting the pacing operation, AC/DC power should be connected if possible.
- A **Switched to Battery** message is displayed when AC/DC power is removed and a battery is installed.
- Keep the HeartStart Intrepid lithium ion battery charged and a spare battery nearby.

WARNINGS: The battery should always be installed so the device is ready for use, whether or not AC/DC power is available at the point of care.

If using the HeartStart Intrepid outside of a professional healthcare facility (excluding a road/ground ambulance), use only the included battery to power the HeartStart Intrepid. Failure to do so may compromise the electrical integrity of the HeartStart Intrepid.

WARNING: For AC power, the HeartStart Intrepid must be plugged into a hospital-graded outlet with a protective ground. Use only a Philips-approved 3-wire AC power cord with ground protection. Failure to do so may cause electric shock.

NOTES: If AC/DC power is used as the only power source during defibrillation (for instance when no battery is installed or when the battery is fully discharged), the HeartStart Intrepid may take longer to charge to the selected energy level.

If power is lost for longer than 30 seconds, all settings reset to configured settings, and a new event is created when power is returned. However, all saved data remains intact (up to the device's memory capacity) and can be found by retrieving the previous event. Keep the battery installed and charged.

Do not position the HeartStart Intrepid in such a way that it becomes difficult to remove the power cord.

To completely disconnect the power supply, unplug from AC/DC power and remove the battery.

If you suspect that the AC power cord is malfunctioning, disconnect it from the device and operate on battery power. Replace the AC power cord before connecting the device to AC power.

Lithium Ion Battery

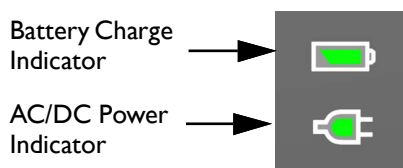
The HeartStart Intrepid uses a lithium ion battery for power:

- For information on battery charging and maintenance, see [“Battery Maintenance”](#) on page 210.
- For information on battery specifications and capacity, see [“Battery”](#) on page 257.

Power Indicators

The power indicators are located in the upper right corner of the HeartStart Intrepid's front panel. The green AC/DC power indicator is lit whenever AC/DC power is connected to the HeartStart Intrepid, even if the device is turned off.

Figure 30 Power Indicators



The green battery charge indicator flashes when the battery is charging. The indicator is solid green when the battery is fully charged and AC/DC power is present. The light is off if no battery is installed, the battery is installed but not functioning properly, or there is no AC/DC power present.

Battery Icons

The battery icon is in the upper right corner of the HeartStart Intrepid display, next to the power indicators. The icon indicates the battery status.

Table 6 Battery Icons

Battery Icon	Battery Status
	Incompatible battery.
	Battery not installed.

Table 6 Battery Icons (Continued)

Battery Icon	Battery Status
	Less than 20% charge (low battery condition).
	20% to 40% charge remaining.
	40% to 65% charge remaining.
	65% to 90% charge remaining.
	90% or more charge remaining.

Powering the Device On and Off

To power on the HeartStart Intrepid, turn the Therapy knob to the mode of operation that you want.

To power off the HeartStart Intrepid, turn the Therapy knob to the Off position. If the device is powered off while in a clinical mode, the HeartStart Intrepid displays a 10-second countdown before turning off as part of the continued use feature.

NOTE: Leave the device plugged in to keep the battery charged and allow automated diagnostic tests to run periodically. There is no harm in leaving the device plugged in indefinitely.

Device Shutdown

When no AC/DC power is connected, and the battery charge level drops to a critically low level, the correct operation of the HeartStart Intrepid can no longer be guaranteed. The device generates an **Imminent Shutdown** alarm. There is approximately one minute to connect the device to AC/DC power or insert a new battery before it shuts down.

If power is returned within 30 seconds after a complete loss of power and the Therapy knob is not in the Off position, the HeartStart Intrepid automatically turns back on, user settings are restored to their values prior to the shutdown, the HeartStart Intrepid continues to use the current event summary and the duration of the shutdown is recorded in the event summary.

WARNING: Pacing is not automatically restarted after the HeartStart Intrepid recovers from a power loss. Pacing must be restarted manually.

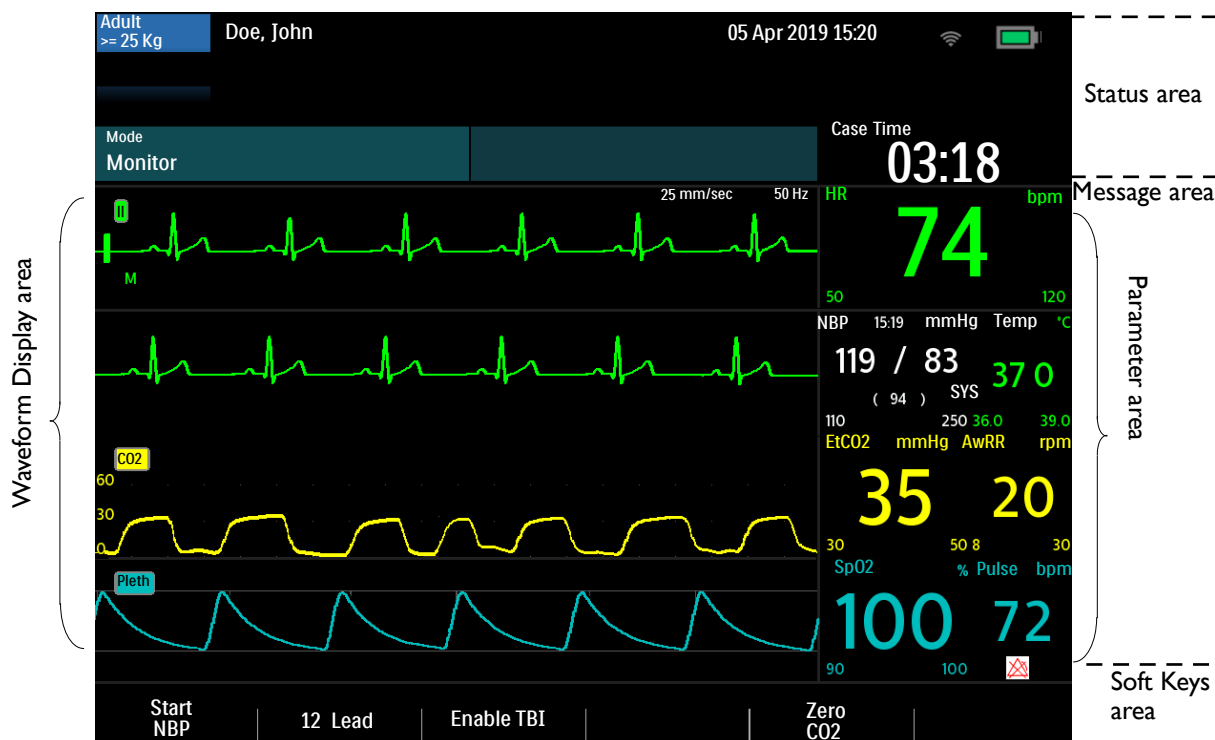
If the HeartStart Intrepid restarts after 30 seconds and the Therapy knob is not in the Off position, all settings are returned to their configured values, a new event summary starts and notifies that the previous event summary was closed.

NOTE: Based on the software's status when power was lost, alarm settings in effect at the time of power loss may be restored in situations where power is returned up to 45 seconds after a power loss.

The Display

The device display layout is configurable. There are five basic areas of the display. See [Figure 31](#).

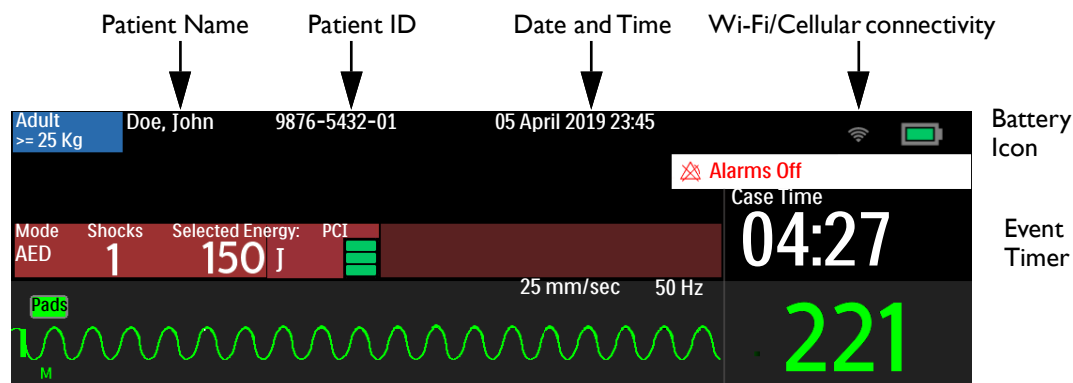
Figure 31 **General Display Layout**



Status Area

The Status Area contains key device and patient information and is configurable.

Figure 32 **Status Area**



Patient information includes:

- **Patient Name/ID.** If entered, displays the patient's name, patient's ID or nothing depending on the current configuration.
- **Date and Time.** The current date and time.

- **Paced Status.** Indicates whether the patient has an internal pacemaker (internally paced). If the paced status has not been selected, the display area is blank. Also, the paced status is not shown in Pacing and AED modes.
- **Event Timer.** The elapsed time for the current event, displayed in hours:minutes:seconds
- **Patient Category.** Adult (defined as $\geq 25\text{kg}$) or Infant/Child (defined as $< 25\text{kg}$). The background color changes with the selected patient category for Adult (blue) and Infant/Child (pink).

Device information includes:

- **Clinical Alarm Indicator.** Indicates the overall state of alarms. If alarms are active and audio is not paused, the indicator is blank. If the alarms are not active, the indicator displays  **Alarm Audio Off** or **Alarm Audio Paused xx min**. In AED mode, the indicator displays  **Alarms Off**.
- **Technical Alarms.** Technical alarms not related to the battery or pacing are displayed in the cyan Technical Alarms area at the top of the display. An arrow indicates there are multiple alarms present, alternating on the display.
- **Battery Icon.** See “Battery Icons” on page 30.
- **Wi-Fi Connectivity Icon.** Indicates whether Wi-Fi connectivity is enabled .
- **Cellular Connectivity Icon.** Indicates whether cellular connectivity is enabled .

Message Area

The message area displays important messages during an event. The messages help with technical alarms and provide clinical suggestions. The type of message shown varies according to the current mode.

Waveform Display

You can display up to four waveforms at one time, depending on the mode being used and your device configuration.

The HeartStart Intrepid is configured to populate each of its four wave sectors with a preconfigured waveform when powered on in Monitor, Manual Defibrillation, Pacing, and AED modes. Wave sectors may contain a variety of information as appropriate to the parameter, view, and task currently being performed.

Wave Sector 1

Wave sector 1 displays an ECG waveform. Available waveforms include: Paddles (unavailable in AED mode), Pads, I, II, III, aVR, aVL, aVF, and V or V1 – V6.

The displayed heart rate is determined by the arrhythmia analysis, which is independent from R-Wave arrows for synchronized cardioversion and Demand mode Pacing.

Figure 33 Wave Sector 1 Labels

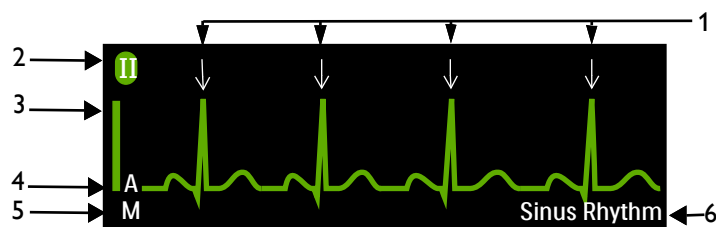


Table 7 Wave Sector 1 Label Descriptions

Number	Label Title	Label Description
1	R-Wave arrows	R-Wave arrows appear when the device is in Sync mode or Demand mode pacing.
2	Lead label	Identifies the lead waveform used for the wave sector.
3	Calibration bar	Reference to compare the actual ECG wave displayed to the selected size.
4	Auto-gain indicator	Indicates whether auto-scaling is active.
5	ECG bandwidth filter	Identifies the ECG bandwidth filter used for the display, based on the ECG Bandwidth for Display configuration. Values: • M – ECG bandwidth for diagnostic monitoring in a motionless and low-noise environment. • E – ECG bandwidth for diagnostic monitoring in environments that may cause ECG noise, such as EMS environments. • S – ECG bandwidth for ST segment monitoring.
6	Rhythm label	For clinical modes except AED mode, identifies the waveform based on the ECG analysis algorithm. Values: Asystole, Cannot Analyze ECG, Learning ECG, Learning Rhythm, Paced Rhythm, Sinus Brady, Sinus Rhythm, Sinus Tachy, SV Brady, SV Rhythm, SV Tachy, Unknown ECG Rhythm, V-Fib/Tach, VTach. If the Display Rhythm Status configuration is off, only the Learning ECG and Learning Rhythm values are used.

NOTES: In synchronized cardioversion mode, the R-Wave arrows indicate which R-Waves a shock would be triggered on if the shock button is pressed.

In Demand Mode Pacing, the time until the next delivered external pace pulse is from the previous pace pulse or the R-Wave arrow, whichever is the most recent. R-Waves immediately after the an external pace pulse are not marked because they are likely caused by the pace pulse.

Wave Sectors 2, 3, and 4

Wave sectors 3 and 4 are automatically populated when the parameter source's cable is connected to the HeartStart Intrepid. If the parameter source is the configured choice of a particular wave sector, it is displayed in that wave sector when available. Available waveforms include: Paddles, Pads, I, II, III, aVR, aVL, aVF, V (or V1 – V6), Pleth, Capnogram, and a Cascade Wave from wave sector 1. If an ECG wave for sectors 2, 3, or 4 is selected, the ECG filter setting is also displayed (except in cascade and annotated ECGs).

An annotated ECG for wave sector 2 can also be selected. For more information, see [“Displaying an Annotated ECG”](#) on page 56.

Changing Displayed Waveforms

Wave sector 1 has a dedicated Lead Select button  to change the displayed lead/source.

Waveforms displayed in the other sectors are changed for the current event using the Smart Select knob.

Menus

Menus with controls and options specific to each HeartStart Intrepid function are accessible using the Smart Select knob on the front panel. Menus are used to adjust volume, select waveforms, select waves for printing, set alarms, enter patient information, generate reports, and complete a variety of other tasks.

To display a menu, press the Smart Select knob to view the Main Menu, then turn the Smart Select knob to scroll through the available choices. The menus have a wrap-around scrolling feature – once the top or bottom of a menu is reached, the next menu item automatically displays.

To make a selection, highlight the menu entry and press the Smart Select knob. Select Exit to close the menu without making a selection. Arrows at each end of the menu indicate additional list options are available in that direction on the menu.

Depending on the use scenario, menu options may be grayed out when unavailable or not applicable for use. They cannot be highlighted or selected.

NOTE: If the Charge button is pressed, any open menus are removed from the display.

Parameter Area

The Parameter Area displays the key physiological numerical values currently being monitored. Displayed values for each parameter include:

- Parameter Label
- Current value for the parameter that may include:
 - **Number** – a valid value was obtained
 - **- ? -** – the value obtained is questionable
 - **blank** – the parameter is unavailable or off
- Currently configured upper and lower alarm limits with the units label
- Alarm Off icon (visible when the alarm is disabled and the global alarm state is not set to off).

For an example, see [Figure 31](#).

Entering Patient Information

Patient information can be entered for the following categories (except in AED mode): **Name**, **ID**, **Age**, **Sex**, and **Paced**.

The first and last name are limited to 18 characters each. The patient ID is limited to 16 characters. If the patient's last name, first name, or ID was previously entered, the HeartStart Intrepid will populate the information.

NOTE: HeartStart Intrepid users are responsible for protecting use, disclosure, and exchange of electronic Protected Health Information in accordance with local laws and healthcare institution policies.

⦿ **To enter patient information on the HeartStart Intrepid:**

- 1 Press the Smart Select knob.
- 2 Turn the Smart Select knob to highlight **Patient Info** and press the Smart Select knob.
- 3 Select the field you want to enter and press the Smart Select knob.
- 4 If you select **Name**, the **Last Name** field and menu appears:
 - a Turn and press the Smart Select knob to highlight and enter each character of the last name. When finished, select **Done**. The last name is saved, and you are prompted to enter the first name.
 - b Turn and press the Smart Select knob to highlight and enter each letter of the first name. When finished, select **Done**. The first name is saved, and you are prompted to enter the patient ID.
- 5 To enter the patient **ID**, turn and press the Smart Select knob to highlight and enter each character of the ID.
- 6 To enter the patient's **Sex**, turn and press the Smart Select knob to highlight and select **Male** or **Female**.
- 7 To enter the patient's **Paced** status, turn and press the Smart Select knob to highlight and select the value as follows:
 - If the patient has an internal pacemaker, select **Yes**.
 - If the patient does not have an internal pacemaker, select **No**.

NOTES: To optimize ECG analysis, set the patient's paced status (whether the patient has an internal pacemaker) correctly.

Paced status is not shown in AED mode.

Event Volume and Annotation

Changing Volume Levels for the Current Event

You can change the volume levels for alarms, voice instructions, and the QRS indicator for the current event. The new volume level remains in place for the duration of the current event. Adjusting one volume type does not affect the other volume types. For example, adjusting the QRS volume does not affect the volumes for alarms and voice instructions.

To change default volume levels for the device, see [“Configurable Parameters”](#) on page 163.

🕒 To change the volume for the current event:

- 1 Press the Smart Select knob.
- 2 Turn the Smart Select knob to highlight **Volume** and press the Smart Select knob.
- 3 Select the volume type (**Alarms, Voice, QRS**) and press the Smart Select knob.
- 4 Select the new volume level and press the Smart Select knob.

Mark Events

The Mark Event button  allows annotation in the event summary and ECG strip when the button is pressed:

- If the Mark Event button is pressed and no event is selected from the Events Menu within five seconds, the Events menu closes and a generic event is logged.
- If the Mark Event button is pressed a second time within five seconds of the first press, a generic event is logged and the Events menu remains open for five seconds.
- If configured, pressing the Mark Event button prints a ten-second ECG strip leading up to the event, the event itself, and five seconds after the event.

🕒 To mark an event:

- 1 Press the Mark Event button. The Events menu appears.
- 2 Turn the Smart Select knob to select the event you want.
- 3 Press the Smart Select knob to mark the event.

Alarms

Alarms indicate changes in the patient, device, and cable conditions that may require attention. Alarms conditions are based on comparisons against preset limits and algorithm results:

- Physiological alarms are associated with patient-related parameter being monitored in a clinical mode. Physiological alarms are not detected in non-clinical modes.
- Technical alarms are associated with an equipment-related issue.
- Latching alarms remain active until the condition that triggered the alarm no longer exists and the alarm is acknowledged.
- Non-latching alarms are automatically removed when the alarm condition no longer exists.

The presence of multiple alarm conditions at the same time is possible. To avoid confusion and to make sure a less serious condition does not hide a more serious condition, alarms are prioritized and categorized. The highest priority alarm condition is announced. If multiple alarms occur for the same parameter at the same priority, all alarms are displayed one at a time.

Table 8 **Alarm Priority**

Alarm Priority	Condition
High Priority	- An immediate response is required. A life-threatening alarm condition exists. - The alarm background is red, accompanied by a high-priority alarm tone. - An example of a high-priority alarm is V-Fib/Tach.
Medium Priority	- Prompt response is required. A non-life-threatening alarm condition exists. - The alarm background is yellow, accompanied by a medium-priority alarm tone. - An example of medium-priority alarm is SpO2 Low.
Low Priority	- Awareness is required. A non-life-threatening alarm condition exists. - The alarm background is cyan, accompanied by a low-priority alarm tone. - An example of a low-priority alarm is Printer Door Open.

Alarm Management and Configuration

You can configure general and function-specific alarms, including whether alarms are on at start up and whether you are reminded when alarms are off. For information about function-specific alarms and messages, see the applicable alarm section in the HeartStart Intrepid *Instructions for Use*. For configuration information, see [Chapter 14 “Configuration”](#) on page 159.

WARNINGS: Silencing either or both audio and visual indications of active alarms can result in missed alarm conditions and inhibit indications of new alarm conditions.

Setting the alarm volume below the ambient noise level can result in missed alarm conditions.

Confirm alarm limits are appropriate for the patient each time there is a new patient event.

For patients who are not continuously attended by a clinician, configure the alarm system and settings based on the patient’s physiological condition.

During a technical alarm condition, a physiological alarm condition may not be accurately detected.

Do not set alarm limits to such extreme values that render the alarm system useless.

A potential hazard exists if different alarm limits are used for the same or similar equipment in any single area.

Clinical Alarm Notification

All alarm conditions are cleared when you switch from a clinical mode to a non-clinical mode.

If you intentionally disconnect a sensor, an alarm sounds. Press the Smart Select knob to stop the alarm. The HeartStart Intrepid prompts you to confirm your selection. Press the Smart Select knob again.

The alarm symbol and message identifies the general alarm status.

Table 9 **Alarm Symbols and Messages**

Alarm Symbol and Message	Alarm Status	Display Location	Criteria for Appearance
 Alarm Audio Paused min (message includes duration of the pause)	- Only visual indications are on for the configured audio pause timeframe. - Audio returns when the pause timeframe is complete.	Upper right corner of the display, beneath the date and time.	The message appears when you press the Alarms button and the configured alarm pause is set to something other than indefinite.
 Alarm Audio Off	Only visual indications are on.	Upper right corner of the display, beneath the date and time.	The message appears when you press the Alarms button and the configured alarm pause is indefinite.
 Alarms Off	Both audio and visual alarm indications are off.	- When in AED mode, upper right corner beneath Date/Time. - Under individual out-of-limit values.	The message appears in AED mode when you press the Alarms button to activate alarms.
 Audio Off	Only visual indications are on.	Lower right corner, above the Smart Select knob.	The message appears as an option for you to press the Smart Select knob to turn audio off.
 Audio Pause	- Only visual indications are on for the configured Audio Pause timeframe. - Audio returns when the pause timeframe is complete.	Lower right corner, above the Smart Select knob.	The message appears as an option for you to press the Smart Select knob to pause audio.

Tone and Alarm Indications

The HeartStart Intrepid uses tone and alarm indications to provide device and patient status.

Table 10 Tones and Alarms

Tone/Indication	Description	Tone level
Single beep and alarm audio reminder tone	Message. Accompanies a new message on the display; generally informational.	2000 Hz
Continuous tone	Charged. Generated when the selected defibrillation energy is reached and continues until the Shock button is pressed or the device is disarmed.	2042 Hz
Continuous tone; lower pitch than a charged tone	Charging. Generated when the Charge button is pressed and continues until the device is fully charged.	1333 Hz
Periodic chirp	Attention. Generated in instances such as low battery and device failure.	1000 Hz
Tone synchronized with each heart beat	QRS. Single beeps aligned with the QRS. The volume of this tone can be set in Configuration, see Table 52 “Configuration – General” on page 164.	667 Hz
Continuous tone with alternating pitch	Imminent shutdown. The device will shut down in one minute.	Alternating between 1000 and 2100 Hz
• Audio. Philips tone lasting 0.5 second, repeated every second. • Visual. Flashing at 2 Hz with 50% duty cycle (0.25 second flash twice every second).	High priority alarm condition.	960 Hz
IEC high priority alarm		Meets IEC 60601-1-8/YY 0709-2009

Table 10 Tones and Alarms (*Continued*)

Tone/Indication	Description	Tone level
• Audio. Philips tone lasting 1 second, repeated every 2 seconds. • Visual. Flashing at 0.5 Hz with 50% duty cycle (one second flash every other second).	Medium priority alarm condition.	480 Hz
IEC medium priority alarm		Meets IEC 60601-1-8/YY 0709-2009
• Audio. Philips tone lasting 0.25 second, repeated every 2 seconds. • Visual. Continuously on.	Low priority alarm condition	480 Hz
IEC low priority alarm		Meets IEC 60601-1-8/YY 0709-2009

NOTE: Tone and alarm volumes range from 45 dB(A) to 85 dB(A).

Changing Alarm Limits

Alarm limits are based on their configuration and the patient category. When alarms are on, alarm limits are visible next to the parameter's numeric value. You can change an alarm limit for the current event. Alarm limits and configurations should be set according to the actual situation of patient.

Alarms are based on the following alarm limit resolutions:

- Heart rate: 1 bpm
- SpO₂: 1%
- NBP: 1 mmHg (0.1 kPa)
- Temperature: 0.1°C
- CO₂: 1 mmHg (0.13 kPa)

🕒 To change an alarm limit:

- 1 Press the Smart Select knob.
- 2 Turn the Smart Select knob to highlight **Measurements/Alarms** and press the Smart Select knob.
- 3 Select the parameter you want to change and press the Smart Select knob.

- 4 Select the parameter limit and press the Smart Select knob.
- 5 Turn the Smart Select knob to adjust the limits. Press the Smart Select knob to finish.

Responding to Alarms

When an alarm condition occurs, tend to the patient first. You can then address the alarm condition in multiple ways:

- Depending on the alarm, **Audio Pause** or **Audio Off** may appear on the display. You can acknowledge the alarm by pressing the Smart Select knob. For more information, see [Table 9 “Alarm Symbols and Messages”](#) on page 39.
- If you pause the alarm audio, a response menu specific to the alarm appears. In the alarm response menu, you can use the Smart Select knob to select from the following options:
 - **Acknowledge.** This menu option pauses the alarm for two minutes. Note that this is different from **Alarm Audio Pause min** (using the Alarms button), which pauses the audio based on the configured **Alarm Pause Time** parameter.
 - **Alarms off.** This turns off both audio and visual alarm indications for the alarm.
 - **New limits.** This enables you to change the alarm limits for the alarm by using the Smart Select knob.
- In Monitor Mode only, you can reset all alarms.

NOTE: If the same alarm condition occurs again or the alarm condition is still present after the configured **Alarm Pause Time**, the alarm audio sounds again.

Resetting Alarms (Alarm Reset)

In Monitor mode, the **Alarm Reset** function affects alarms in the following ways:

- For all alarms where the alarm condition is still present, the **Alarm Reset** function removes audio indication of all active alarm conditions, but the visual indications of all active alarm conditions remain.
- For all alarms where the alarm condition is no longer present, the **Alarm Reset** function removes audio and visual indications of the alarms.
- If a new instance of an alarm condition occurs, the audio and visual indications of the alarm occur again, which you can reset or acknowledge as appropriate.

You can access the **Alarm Reset** function in the following ways (remember that this affects all active alarm conditions):

- When an alarm condition occurs and **Audio Pause** appears in the lower right corner of the screen, turn the Smart Select knob to **Alarm Reset** and press the Smart Select knob to confirm.
- Press the Smart Select to view the main menu and use the Smart Select knob to navigate to and select **Alarm Reset**.

Passwords

The HeartStart Intrepid requires passwords to enter Service mode and to make certain changes in Configuration mode. Passwords can be changed from their originally set values.

Keep the passwords confidential.

Service Password

Service mode requires a password. For instructions on how to set up and change the Service mode password, see the HeartStart Intrepid *Service Manual*.

Configuration Password

The Configuration mode password is changed in Service mode, and the Service mode password is required to change the Configuration mode password. For instructions on how to change the Configuration mode password, see the HeartStart Intrepid *Service Manual*.

Data Management Password

The Data Management mode has an optional password that can be configured **On** or **Off** in the Configuration mode **General** menu. The Data Management password can be changed in Configuration mode. As an extra security measure, the Configuration password is needed to change the Data Management mode password.

- © To change the Data Management mode password:
- 1 In the **New Password** field, enter a new password.
 - 2 In the **Confirm Password** field, re-enter the new password.
 - 3 In the **Configuration Password** field, enter the Configuration mode password.
 - 4 Press the **[Save]** soft key to save the password.

Safety Considerations

The following general warnings and cautions apply to the use of the HeartStart Intrepid. Additional warnings and cautions specific to a particular feature are provided in the appropriate sections.

WARNINGS: Never operate the HeartStart Intrepid in standing water. Do not immerse or pour fluids on any portion of the HeartStart Intrepid. If the device does get wet, dry it with a towel. Using wet device is hazardous to the operator and bystanders.

Do not use the HeartStart Intrepid in the presence of flammable anesthetics (such as a flammable anesthetic mixture with air, oxygen, or nitrous oxide), flammable agents (such as gasoline), or in an oxygen-rich environment. Use of the device in these environments may cause an explosion hazard.

The HeartStart Intrepid is not intended to be deployed in settings or situations that promote use by untrained personnel. Operation by untrained personnel can result in injury or death. This device and its accessories are not intended for home use.

Do not expose the HeartStart Intrepid or its accessories to X-ray or strong magnetic fields (MRI).

Use of the HeartStart Intrepid is restricted to a single patient at a time.

For a more accurate rhythm analysis, set the patient's paced status (whether the patient has an internal pacemaker) correctly. The paced status is used in the algorithms during rhythm analysis.

When transporting a patient or carrying the HeartStart Intrepid, it is important to position it with the display facing away from the body or other surfaces. If not, the Therapy and Smart Select knobs may be bumped and inadvertently moved from their intended position.

Do not touch or move patient during analysis.

Avoid connecting the patient to several devices at once. Leakage current limits may be exceeded. Do not use a second defibrillator on the patient while pacing with the HeartStart Intrepid.

Ensure all device connections that use small-bore connectors (especially those for noninvasive blood pressure) are connected correctly, consistent with ISO 80369 requirements. Misuse or misconnection of small-bore connectors with the device and accessories may cause patient injury from inappropriate delivery of gases or air.

Do not use the USB port to connect to any non-approved USB data drive or other devices, especially near a patient. Failure to do so may result in electric shock.

Allow for settling time if the device has been in extreme temperatures. The time required for the device to warm from -20°C before use is 80 minutes. The time required for the device to cool from 70°C before use is 80 minutes.

Allow the HeartStart Intrepid to stabilize within the operating temperature range for 30 minutes prior to operation.

Remove all moisture from the device before use, especially condensation that may occur on or near the electrical ports and interfaces of the device after storage. Failure to do so may affect device performance or damage the device.

The HeartStart Intrepid should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the HeartStart Intrepid should be observed to verify normal operation in the configured use.

Do not touch the communication ports and a patient simultaneously.

When several items are interconnected, current leakage may occur.

Defibrillator protection requires use of manufacturer-specified accessories.

CAUTIONS: Be aware of patient cables, including ECG monitoring equipment when used with high frequency surgical equipment.

For transport during non-use, ensure the HeartStart Intrepid is turned off. The HeartStart Intrepid may be transported in the following vehicles only:

- Fire apparatus
- Police vehicles
- Road ambulances
- Passenger cabin (not the warehouse cabin or pod) of rotary and fixed-wing air ambulances

Improper transportation may damage the device.

NOTES: Electrodes, multifunction electrode pads, Q-CPR meter 2 adhesive pads, and external paddles may cause skin irritation on the patient.

Defibrillation and pacing therapy may cause minor skin burns on the patient underneath the applied paddles or multifunction electrode pads.

Defibrillation and pacing therapy may cause patient discomfort or muscle contractions.

Defibrillation and pacing therapy with external paddles may cause patient discomfort, bruising, or tenderness.

If a daylight saving time change occurs between the start and end of an event, the timestamps for that event are not adjusted. The next event does use the adjusted time.

Clinical usage of the HeartStart Intrepid does not require any special ElectroStatic Discharge (ESD) precautionary procedures.

CPR Safety Considerations

WARNINGS: If the HeartStart Intrepid is unavailable or inoperable for defibrillation during a cardiac event, perform CPR on the patient immediately.

CPR may cause discomfort, bruising, or tenderness even when performed properly. In rare cases, skin laceration or soft tissue injuries may also occur.

CAUTION: Perform CPR as recommended by the American Heart Association (AHA) and the European Resuscitation Council (ERC) guidelines, in conjunction with your organization's protocol.

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no vertical margin lines or other markings present.

ECG Monitoring

This chapter describes the ECG and arrhythmia monitoring functions of the HeartStart Intrepid. The device uses the Philips ST/AR Algorithm for ECG analysis.

This chapter is divided into the following major sections:

	Overview	p. 47
	Safety Considerations	p. 48
	Preparing to Monitor ECG	p. 49
	Monitoring ECG Using Multifunction Electrode Pads	p. 50
	Monitoring ECG Using Electrodes	p. 50
	ECG Electrode Placement	p. 51
	Lead Selection Criteria	p. 53
	Available Lead Choices	p. 53
	Selecting the Waveform	p. 54
	Changing the ECG Gain of the Primary Lead	p. 55
	Displaying an Annotated ECG	p. 56
	Arrhythmia Monitoring	p. 56
	Heart Rate and Arrhythmia Alarms	p. 59
	Troubleshooting	p. 61

Overview

You can monitor your patient's ECG using the following methods:

- Multifunction electrode pads. If both ECG multifunction electrode pads and ECG monitoring electrodes are attached, you can select either as the ECG lead.
- 3-, 5-, or 10-lead ECG monitoring electrode sets. When 3-lead ECG monitoring is used, only one ECG lead vector is available. If using 5- or 12-lead ECG monitoring, up to four ECG lead vectors are available at the same time for display.
- External paddles (for quick assessment only, not for continuous monitoring).

You can use the ECG Gain Select  button to adjust the ECG size of the primary lead. Configurable heart rate and arrhythmia alarms notify you of the patient status.

To primarily monitor the patient's ECG waveform in Monitor View, turn the Therapy knob to **Monitor**. In Monitor View, four waves can be reviewed simultaneously while monitoring all current vital sign parameters. For information about waveform display, see [“Waveform Display”](#) on page 33.

Intended Use Population

ECG monitoring is intended for use on:

- Patients 25 kg (55 lb) or over or those 8 years old or over by using the Adult patient category.
- Patients less than 25 kg (55 lb) or under 8 years old by using the Infant/Child patient category.

Safety Considerations

WARNINGS: When monitoring neonatal ECGs, inaccurate measurements and alarms could result because of differences in the characteristics of the adult ECG compared to the neonatal ECG.

When an external pacemaker is being used on a patient, arrhythmia monitoring is severely compromised due to the high energy level in the pacer pulse. This may result in the arrhythmia algorithm's failure to detect pacemaker non-capture or asystole.

Do not use an external monitor as an ECG source.

Use only approved lead-sets with the HeartStart Intrepid. Failure to do so may introduce noise and result in intermittent **Cannot Analyze ECG** messages.

For accurate rhythm analysis, ensure that the patient's paced status is correctly defined.

To prevent misdiagnosis, ensure the appropriate ECG bandwidth filter is used for the patient condition and environment.

During complete heart block or pacemaker failure (to pace or capture) tall P-Waves (greater than 1/5 of the average R-Wave height) may be erroneously counted by the arrhythmia algorithm, resulting in missed detection of certain arrhythmias.

NOTES: If the ECG Out cable is used to send an ECG signal from the HeartStart Intrepid to a bedside monitor, the ECG signal and alarms on the HeartStart Intrepid should be considered primary. The bedside monitor ECG is ancillary/secondary.

Lead II is the only lead selection on the primary and secondary devices that accurately displays the waveform. The secondary device lead selection should remain on Lead II. To avoid confusion, the primary device lead selection should also be set to Lead II, if clinically possible.

If the device is pacing or if it detects internal pacemaker pulses, the ECG Out waveform includes pace pulse markers at the appropriate points.

Do not use a Philips SureSigns monitor connected to the HeartStart Intrepid. The devices are not compatible.

Electrosurgery Considerations

The HeartStart Intrepid is suitable for use in the presence of high-frequency surgical equipment. Following electrosurgery interference, the device returns to the previous operating mode within 10 seconds without loss of stored data.

To help reduce burn hazards associated with a defect in electrosurgical equipment:

- Ensure the electrodes of the ECG lead are properly placed. For information on proper ECG lead placement, see [“ECG Electrode Placement”](#) on page 51.
- Refer to the electrosurgery device's instructions for use.

WARNING: The HeartStart Intrepid leads ECG is not suitable for direct cardiac application.

CAUTIONS: Measurement accuracy may be temporarily decreased while performing electrosurgery or defibrillation. This does not affect patient or equipment safety.

Be aware of patient cables, including ECG monitoring equipment, when used with high frequency surgical equipment.

Do not entangle the ECG cables with the electrosurgical equipment wires.

Do not place the ECG cabling near the electrosurgical equipment's grounding plate.

Preparing to Monitor ECG

You can monitor ECG using multifunction electrode pads or ECG electrodes. You also do a quick look with external paddles. See the *Improving ECG Quality* Application Note.

Check the expiration date on the pads package and inspect the package for any damage:

- Use multifunction electrode pads prior to their expiration date. Discard expired or damaged pads.
- Discard pads after use. Do not reuse pads. Do not use for more than eight hours of continuous pacing.
- If monitoring for an extended period of time, monitoring electrodes and multifunction electrode pads may need to be changed periodically. Refer to the manufacturer's documentation for how often to replace the monitoring electrodes or pads.

Skin Preparation

Skin is a poor conductor of electricity, so proper skin preparation is important to achieving good electrode/pad-to-skin contact.

CAUTION: To reduce the risk of burns:

- Before placing the electrode on the patient:
 - Check the electrode for defects such as dried-out or insufficient amounts of conductive gel or adhesive.
 - Thoroughly clean and dry the site. It is safer to assume that the site should be shaved than not shaved.
- For the electrode placement, choose a flat or relatively flat muscular area that will not bear the patient's weight during surgery and where the electrode will not come into contact with fluids.

After applying the electrode, use your hand to smooth the electrode from the outside to the inside of the pad so that no gel is forced out from underneath the pad.

☉ To prepare the skin:

- 1 Identify the appropriate locations:
 - For pads, see the pads package.
 - For electrodes, see [“ECG Electrode Placement”](#) on page 51.
- 2 If necessary, clip or shave hair at the site.
- 3 Clean and abrade skin at the site.

- 4 Dry the site briskly to increase capillary blood flow in the tissues and to remove oil and skin cells.

Monitoring ECG Using Multifunction Electrode Pads

- © To monitor ECG using multifunction electrode pads:
 - 1 Prepare the skin. See [“Skin Preparation”](#) on page 49.
 - 2 Ensure that the Therapy cable is connected to the HeartStart Intrepid. See [“Connecting the Therapy Cable”](#) on page 10.
 - 3 Connect the multifunction electrode pads to the Therapy cable. See [“Connecting Multifunction Electrode Pads”](#) on page 11.
 - 4 Apply the multifunction electrode pads to the patient as described on their package or according to your organization’s protocol.

Monitoring ECG Using Electrodes

WARNINGS: Do not allow conductive parts of the electrodes or associated connectors of applied parts to contact other conductive material, including earth.

Avoid touching monitoring electrodes and other measuring devices when they are applied to the patient. Doing so can degrade safety and may affect results.

- © To monitor ECG using electrodes:
 - 1 Prepare the skin. See [“Skin Preparation”](#) on page 49.
 - 2 Attach the snaps or grabbers to the electrodes before placing the electrodes on the patient.
 - 3 Apply electrodes by peeling them, one at a time, from the protective backing and sticking them firmly to the patient’s skin.

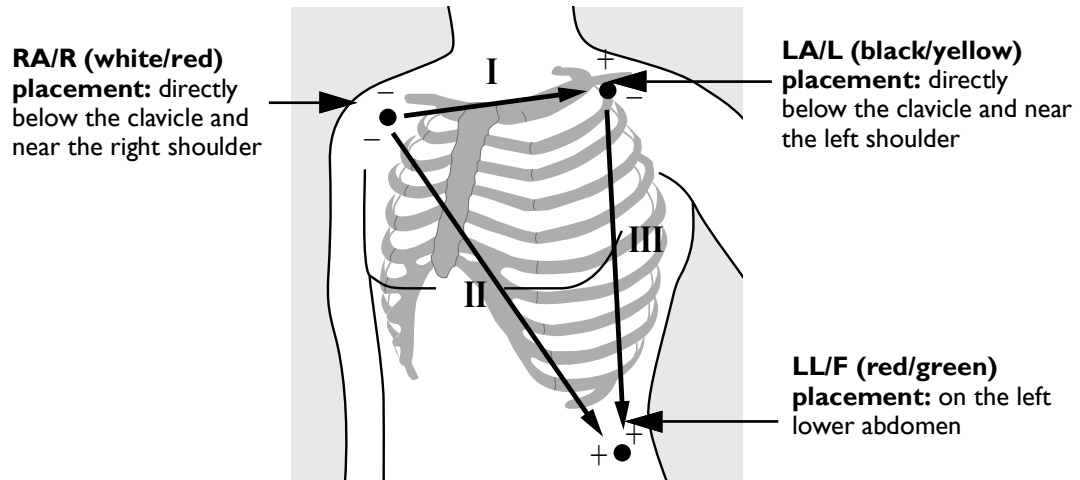
Press around the entire edge of each electrode to ensure they are secure; and make sure the lead wires do not pull on the electrodes. For electrode locations, see [“ECG Electrode Placement”](#).
 - 4 If not preconnected, connect the ECG cable. See [“Connecting the ECG cable”](#) on page 15.

ECG Electrode Placement

3-Lead ECG Electrode Placement

Figure 34 shows the typical electrode placement for a 3-lead ECG set.

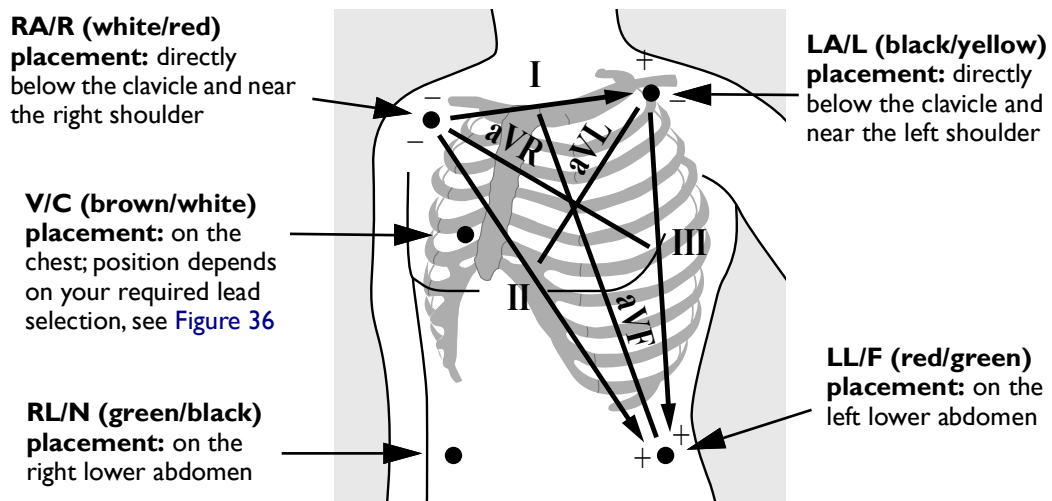
Figure 34 3-Lead ECG Electrode Placement



5-Lead ECG Electrode Placement

Figure 35 shows the typical electrode placement for a 5-lead ECG set.

Figure 35 5-Lead ECG Electrode Placement

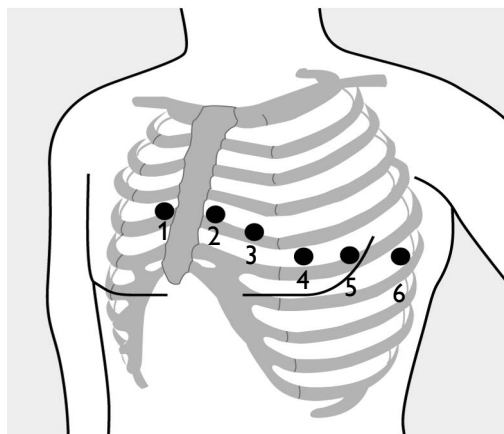


V/C Electrode Placement

The single V/C lead of a 5-lead cable may be placed in any of the precordial electrode positions as shown in Figure 36 (V1/C1 through V6/C6).

The V/C electrode of a 5-lead cable appears as V on the HeartStart Intrepid. The RL electrode is always used as the reference electrode, regardless of the V/C lead selection. If a V/C electrode is used and the RL electrode is unavailable, the V electrode can act as a reference electrode.

Figure 36 V/C Electrode Placement



V/C 1 placement: fourth intercostal space at right sternal margin

V/C 2 placement: fourth intercostal space at left sternal margin

V/C 3 placement: midway between V/C 2 and V/C 4

V/C 4 placement: fifth intercostal space at left midclavicular line

V/C 5 placement: same level as V/C 4 on anterior axillary line

V/C 6 placement: same level as V/C 4 at left mid axillary line

Locating the Fourth Intercostal Space

For accurate V/C lead placement and measurement, you must properly locate the fourth intercostal space.

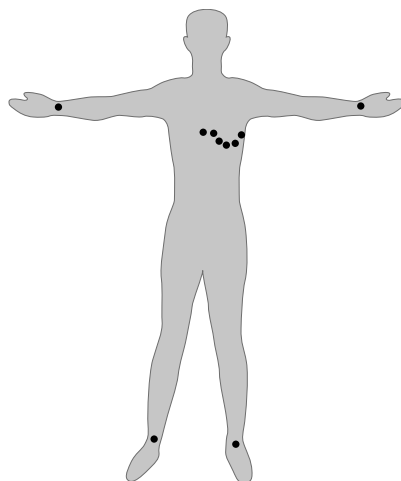
☉ To locate the fourth intercostal space:

- 1 Locate the second intercostal space by first palpating the Angle of Louis (small bony protuberance where the body of the sternum joins the manubrium). This rise in the sternum is where the second rib is attached, and the space just below this is the second intercostal space.
- 2 Palpate and count down the chest until the fourth intercostal space is located.

12-Lead ECG Electrode Placement

When performing a 12-lead ECG, attach the limb leads to the patient's extremities. [Figure 37](#) shows electrode placement for a 12-lead ECG set.

Figure 37 12-Lead Placement



12-Lead ECG: In a 12-lead ECG using 10 electrodes, an electrode is placed on the right arm, left arm, right leg, and left leg. Six V/C electrodes are placed on the chest. The right leg electrode is the reference electrode.

Lead Selection Criteria

For a QRS complex to be accurately detected, a suitable lead must be used for monitoring the patient. The following table lists criteria to help you identify a suitable lead for non-paced and paced patients.

For patients with pacemakers, ensure the paced status is set correctly on the HeartStart Intrepid.

Table 11 Lead Selection Criteria for Non-Paced and Paced Patients

Criteria for Non-Paced Patients	Criteria for Paced Patients
• QRS complex should be tall and narrow (recommended amplitude > 0.5 mV). • R-Wave should be above or below the baseline but not biphasic. • P-Wave should be smaller than 1/5 R-Wave height. • T-Wave should be smaller than 1/3 R-Wave height.	• Ensure the criteria for non-paced patients are met. • Pace pulses must be large enough to be detected (half the height of the QRS complex) with no re-polarization artifact. Some unipolar pacemakers display pace pulses with re-polarization tails which may be counted as QRSs in the event of cardiac arrest or other arrhythmias. Choose a lead to minimize the size of re-polarization tails.

NOTES: To prevent detection of P-Waves or baseline noises as QRS complexes, the minimum detection level for QRS complexes is set at 0.15 mV, according to IEC 60601-2-27/YY 1079-2008 specifications. If the ECG signal is too weak, a false alarm for asystole may be detected.

All isoelectric segments including I and K waves are excluded from the Q, R, S, R' and S' waves.

Available Lead Choices

Available monitoring leads vary depending on what type of ECG cable is connected to the HeartStart Intrepid and its configuration:

- For a 3-lead ECG set, the following leads are available: I, II, III.
- For a 5-lead ECG set, the following leads are available: I, II, III, aVR, aVL, aVF, V.
- For a 12-lead ECG set, the following leads are available: I, II, III, aVR, aVL, aVF, V1-V6.

CAUTION: Line isolation monitor equipment may produce power line transients that may resemble actual cardiac waveforms and thus inhibit heart rate alarms. Keep electrode wires and cables away from power cords to minimize this problem.

NOTES: Signals from TENS or ESU units can cause artifact.

For patients who exhibit intrinsic rhythm only, the risk of missing cardiac arrest may be reduced by monitoring these patients with low heart rate limit at or slightly above the basic/demand pacemaker rate. A low heart rate alarm sounds when the patient begins pacing. Proper detection and classification of the paced rhythm can then be determined.

When the ECG Analog Output is used, detected internal pacemaker pulses are inserted into the output as pulses of less than 3.5 ms in width when measured at 50% of the peak of the pulse. The amplitude of the inserted pulse is > 40% and < 70% of the detected pacemaker pulse amplitude for pulses widths of 0.5 ms to 2.0 ms.

Selecting the Waveform

When you first turn on the device, Wave Sector 1 shows the primary ECG lead:

- For all modes except AED mode, Lead II is the default ECG lead.
- For AED mode, Pads is always the primary ECG lead. The Lead Select button is inactive.

For information on wave settings, see [Table 63 “Configuration – Waves Settings”](#) on page 171. You can change the waveform for each sector during a patient event. For steps to change the waveform in non-AED modes or AED mode, see the following sections.

NOTE: When you first turn on the device, if the default lead is not available or is of poor quality, the device automatically searches for the ECG source and lead with the best quality and displays that new lead in Wave Sector 1 in non-AED modes. The device searches for an active ECG source and lead in the following order: default lead, II, Pads (or Paddles), I, III

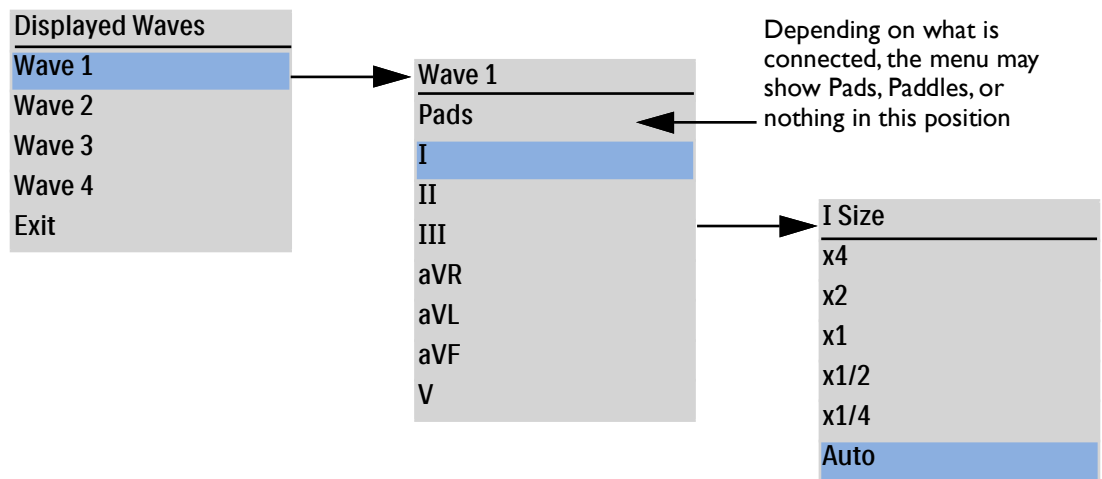
Monitor, Manual Defibrillation, and Pacing Modes

The ECG wave for wave sector 1 is selected by using the Lead Select button  or the Displayed Waves menu. The waves for wave sectors 2, 3, and 4 are selected by using the Displayed Waves menu.

Use the ECG Gain Select  button on the front panel to adjust the ECG gain of primary lead. For other wave sectors, use the following steps:

- ⦿ To select a waveform using the Displayed Waves menu:
- 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight **Displayed Waves** and press the Smart Select knob.
 - 3 Select the wave sector to modify and press the Smart Select knob.
 - 4 Select the new wave type and press the Smart Select knob.
 - 5 If needed, select the appropriate ECG wave size and press the Smart Select knob:
 - Selecting the **Auto** size automatically adjusts the ECG size to the maximum size allowed without clipping the wave sector.
 - Adjusting the ECG wave size on the display only affects the wave size on the display for viewing. It does not affect the ECG signal used for arrhythmia analysis. Detected R-Waves for Synchronized Cardioversion and Demand Pacing are also unaffected by the ECG wave size.

Figure 38 Displayed Waves Menus



NOTE: The Pads ECG wave is automatically populated in wave sector 1 in AED mode.

Dashed Line in ECG Display

A dashed line on the ECG display indicates that there is no ECG signal received from the patient in the wave sector. You can troubleshoot the currently selected lead or select a different lead.

© To replace a dashed line with a different lead:

- In wave sector 1, use the Lead Select button to cycle through available leads and select an appropriate lead, or
- Use the **Displayed Waves** menu to select an appropriate lead.

NOTE: Dashed lines may briefly occur with a change of the selected lead.

Changing the ECG Gain of the Primary Lead

Use the ECG Gain Select  button on the front panel to change the ECG gain of primary lead.

Unless viewing all 12 leads, pressing the ECG Gain Select button increases the vertical scale of the primary lead waveform by one setting. If the ECG size is **x4** when the button is pressed, the vertical scale of the primary lead reverts to **x1/4**.

If viewing all 12 leads, or if the primary lead is set to **Auto**, then pressing the ECG Gain Select button has no effect.

Displaying an Annotated ECG

The HeartStart Intrepid can display an annotated ECG with arrhythmia beat labels in wave sector 2. The same ECG source appearing in wave sector 1 is displayed in wave sector 2 with a six-second delay. **Delayed** appears near the waveform. White arrhythmia beat labels also appear.

☉ To display an annotated ECG:

- 1 Press the Smart Select knob.
- 2 Turn the Smart Select knob to highlight **Displayed Waves** and press the Smart Select knob.
- 3 Select **Wave 2** and press the Smart Select knob.
- 4 Select **Annotated ECG** and press the Smart Select knob.

Arrhythmia Monitoring

The HeartStart Intrepid uses the Philips ST/AR Algorithm. Arrhythmia analysis provides information on the patient's condition, including heart rate and arrhythmia alarms. The HeartStart Intrepid uses the ECG lead appearing in wave sector 1 for single-lead arrhythmia analysis.

During arrhythmia analysis, the monitoring function continuously performs the following actions:

- Optimizes ECG signal quality to facilitate arrhythmia analysis. The ECG signal is continuously filtered to remove baseline wander, muscle artifact, and signal irregularities. Also, if the patient's internal paced status is set to yes (has an internal pacemaker), pace pulses are filtered out to avoid processing them as QRS beats.
- Measures signal features such as R-Wave height, width and timing.
- Creates beat templates and classifies beats to aid in rhythm analysis and alarm detection.
- Examines the ECG signal for ventricular arrhythmias and asystole.

NOTE: Because the Philips ST/AR Algorithm is the HeartStart Intrepid's cardioteach source and is needed to generate heart rate and heart rate alarms, the algorithm can never be disabled. Arrhythmia and heart rate alarms can be turned off. See [“Setting Alarms”](#) on page 61.

ST/AR cardioteach and alarms, when activated, also work in AED mode for ECG monitoring.

Arrhythmia Beat Labels

Table 12 **Arrhythmia Beat Labels**

Label	Description	Where Displayed
N	Normal	Above QRS
V	Ventricular Ectopic	
P	Paced	
L	Learning Patient's ECG	
?	Insufficient information to classify beats	

Table 12 **Arrhythmia Beat Labels (Continued)**

Label	Description	Where Displayed
'	Pacer Spike	Above waveform, where pacer spike was detected (If the patient is both atrially and ventricularly paced, the display shows two marks above the waveform aligned with the atrial and ventricular pacing.)
"	Biventricular Pace Pulse	Above waveform where the biventricular pace pulse was detected
A	Artifact (noisy episode)	Above waveform where noise was detected
I	Inoperative condition (e.g. there is a lead off)	Above waveform; at start of a technical alarm, every second of the alarm and at the end
M	Pause, Missed Beat, No QRS	Above waveform where condition detected

Heart Rate Averaging

For heart rates greater than or equal to 50 bpm, the heart rate is determined by averaging the 12 most recent R-R intervals. Beats N, P, and V are included. If the heart rate drops below 50 bpm, the four most recent R-R intervals are used in the average.

For ventricular tachycardia alarms, which have a user-definable PVC run length limit, the heart rate is based on the user-selected PVC length, up to 9 PVCs maximum. The heart rate display update time is 1 second maximum.

Aberrantly-Conducted Beats

As P-Waves are not analyzed, it is difficult and sometimes impossible for the algorithm to distinguish between an aberrantly-conducted supraventricular beat and a ventricular beat. If the aberrant beat resembles a ventricular beat, it is classified as a ventricular beat. Always select a lead where the aberrantly-conducted beats have an R-Wave that is as narrow as possible to minimize incorrect classifications.

Intermittent Bundle Branch Block

Bundle branch and other fascicular blocks create a challenge for the arrhythmia algorithm. If the QRS complex changes considerably from the learned normal due to bundle branch block, the blocked beat may be incorrectly identified as ventricular, and may cause false PVC alarms. Always select a lead where bundle branch block beats have an R-Wave that is as narrow as possible to minimize incorrect classifications.

Arrhythmia Learning/Relearning

When arrhythmia monitoring starts, a “learning” process is initiated. The goal is to learn the patient’s normal complexes and/or paced complexes (if the patient with an internal/transvenous pacemaker is in paced rhythm). The learning process involves the first 15 valid (non-noisy) beats encountered during the learning phase.

The QRS selected to represent the “normal” complex includes the beat that is the most frequently seen, narrowest, on-time beat. For this reason, learning should not be initiated when the patient’s rhythm is primarily ventricular.

Arrhythmia learning/relearning automatically occurs when:

- The Therapy knob is turned to **Monitor, Pacer, AED** or a Manual Defibrillation setting.
- Any time there is a change in the lead selection for wave sector 1.
- After the correction of a leads or pads-off condition that has been active longer than 60 seconds.

WARNINGS: If arrhythmia relearning takes place during a ventricular rhythm or during a period of poor ECG signal quality, ectopic beats may be incorrectly learned as the normal QRS complex. This may result in missed detection of subsequent events of VTach and high PVC rates, therefore:

- Take care to initiate arrhythmia relearning only when the ECG signal is noise-free.
- Be aware that arrhythmia relearning can happen automatically.
- Respond to any messages.
- Display an annotated wave to ensure the beat labels are correct.

Pacemaker Pulse Rejection: When monitoring arrhythmia for a patient who has an internal pacemaker and exhibits only intrinsic rhythm, the monitor may erroneously count paced pulses as QRS complexes when the algorithm first encounters them. This may result in a failure to detect cardiac arrest. For a patient with an internal pacemaker, ensure the patient's paced status is set to Yes on the device.

The device algorithm may not be able to identify and reject all paced pulses. When this happens, the pulses are counted as a QRS complex and could result in incorrect HR and failure to detect cardiac arrest or some arrhythmias. Keep pacemaker patients under close observation. See [“Specifications and Safety”](#) on page 253 for details on Pacemaker Pulse Rejection Capability.

Initiating Arrhythmia Relearning Manually

If the beat detection is not occurring or if beat classification is incorrect and results in a false alarm, initiate manual relearning. If the same signal condition that caused the algorithm to perform poorly still exists, relearning does not correct the problem. The problem can only be corrected by improving the signal quality, such as selecting a different lead.

☉ To initiate relearning manually:

- 1 Press the Smart Select knob.
- 2 Turn the Smart Select knob to highlight **Measurements/Alarms** and press the Smart Select knob.
- 3 Select **HR/Arrhythmia** and press the Smart Select knob.
- 4 Select **Relearn Rhythm** and press the Smart Select knob. **Learning ECG** and **Learning Rhythm** messages appear in the bottom portion of wave sector 1.

Heart Rate and Arrhythmia Alarms

The HeartStart Intrepid detects HR and arrhythmia alarm conditions by comparing ECG data to a set of predefined criteria. An alarm can be triggered by a rate exceeding a threshold (such as HR > configured limit), an abnormal rhythm (such as ventricular tachycardia), or an ectopic event (such as PVC > configured limit).

HR/Arrhythmia alarms can be generated for the conditions shown in [Table 13](#) and [Table 14](#). Once generated, they appear as alarm messages in the HR alarm status area above the HR numeric. When ECG alarms are off, an **ECG Alarms Off** message appears above the HR numeric. There are both audio and visual alerts.

For more information on alarms, see [“Alarms”](#) on page 37.

Table 13 Heart Rate and Arrhythmia Physiological Alarms

Alarm Message	Condition	Type of Alarm	Indication
Asystole	No detectable beats for four seconds in the absence of V-Fib	High Priority Latching Alarm	Red Alarm message with alarm tone
VFib/VTach	A fibrillatory wave detected for four seconds		
VTach	Consecutive PVCs and HR exceed configured limits		
Extreme Brady	• 10 bpm below HR low limit • 30 bpm or lower HR (regardless of configured HR low limit)		
Extreme Tachy	Adult: 20 bpm above HR High limit, up to 180 bpm, 200 bpm for limits between 180-200. Infant/Child: 20 bpm above HR High limit, up to 220 bpm, 240 bpm for limits between 220-240. For higher rates, the limit is equal to the HR High limit.		
Pacer Not Capture	No QRS following internal pacer pulse.	Medium Priority Latching Alarm	Yellow Alarm message with alarm tone
Pacer Not Pace	No QRS or pacer internal pulse detected.		
PVC > /min. (detected rate > limit)	The number of detected PVCs in a minute exceed the limit.	Medium Priority Latching Configurable Alarm	
HR High	The HR exceeds the configured HR High limit.		
HR Low	The HR is below the configured HR Low limit.		

NOTE: The high heart rate alarm condition is not detected when the HR High limit is configured greater than the maximum Extreme Tachy threshold. Instead, the Extreme Tachy alarm sounds. The low heart rate alarm condition is not detected when the HR Low limit is configured less than or equal to the minimum Extreme Brady threshold.

Table 14 Heart Rate and Arrhythmia Technical Alarms

Alarm Message	Condition	Type of Alarm	Indication
Leads Off Pads Off Paddles Off	The multifunction electrode pad/paddles or leads used as the source for wave sector 1 during synchronized cardioversion may be disconnected or not attached securely while the device is charged or charging.	High Priority Non-Latching Alarm	Red Alarm message with alarm tone
Cannot Analyze ECG	ECG data in wave sector 1 cannot be analyzed – an electrode used is disconnected/not attached securely.		
	The analyzing algorithm cannot analyze the ECG signal.		
ECG Equipment Malfunction	A malfunction has occurred in the ECG hardware.		
Pads ECG Equipment Malfunction	A malfunction has occurred in the Pads ECG hardware.		
Therapy Disabled: Run Op Check	Therapy is disabled due to an equipment failure.		

Arrhythmia Alarm Precedence

For an illustration of arrhythmia alarm precedence, see [Figure 39](#) and [Figure 40](#).

Figure 39 Basic Mode Arrhythmia Alarm Priority Chain

For Monitor, Manual Defibrillation, and Pacing

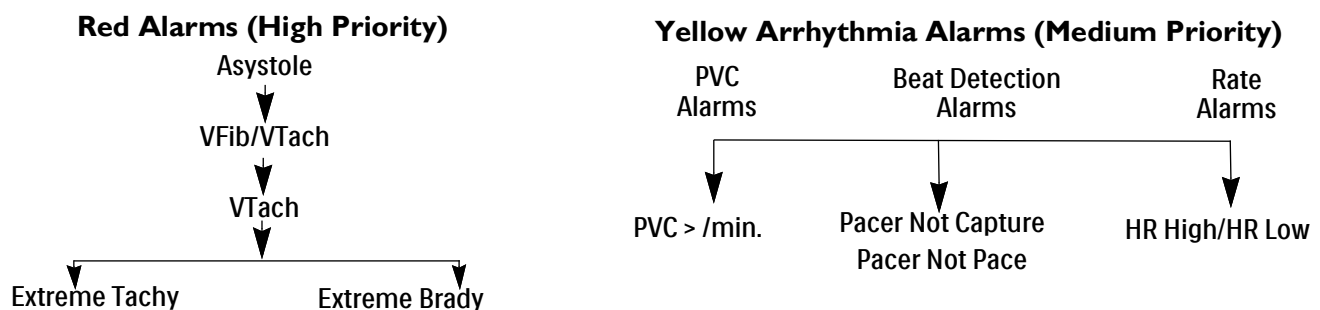


Figure 40 Cardiotach Mode Arrhythmia Alarm Priority Chain

For AED Mode Only



Setting Alarms

Alarm settings for Heart Rate (HR), VTach, and PVC Rate Limit for the current patient event can be changed with the Smart Select knob during the event. Settings for other HR and arrhythmia alarms may not be changed.

Changing Alarm Limits

- ⦿ To change HR, VTach, or PVC Rate Limits:
 - 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight **Measurements/Alarms** and press the Smart Select knob.
 - 3 Select **HR/Arrhythmia** and press the Smart Select knob.
 - 4 Select the limit you want to change and press the Smart Select knob.
 - 5 Select the new value and press the Smart Select knob.

Enabling/Disabling Alarms

- ⦿ To enable/disable the HR and Arrhythmia alarms:
 - 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight **Measurements/Alarms** and press the Smart Select knob.
 - 3 Select **HR/Arrhythmia** and press the Smart Select knob.
 - 4 Select **Alarms On (Alarms Off)** and press the Smart Select knob.

Responding to Alarms

When an alarm occurs, the audio pause label appears above the Smart Select knob. Press the knob to silence the alarm audio while attending to the patient. The alarm sounds again if the condition continues to exist beyond the configured alarm pause period or another alarm condition occurs.

After pausing the audio on the HeartStart Intrepid, attend to the patient and press the Smart Select knob to acknowledge the alarm condition. If required, adjust the alarm limits using the Smart Select knob. Certain lethal arrhythmias have only **Acknowledge** as a menu option.

Troubleshooting

If the HeartStart Intrepid does not operate as expected during ECG and arrhythmia monitoring, see [“ECG Problems”](#) on page 231.

NOTES

[illegible]

AED Mode Option

This chapter describes how to use the optional semi-automated external defibrillation (AED) mode of the HeartStart Intrepid. You can configure AED functions to better meet the needs of your organization or resuscitation team.

This chapter is divided into the following major sections:

	Overview	p. 63
	Safety Considerations for AED Therapy	p. 64
	AED View	p. 65
	Using AED Mode to Defibrillate	p. 67
	AED Mode User Messages	p. 70
	Using AED Mode to Monitor	p. 73
	Configurable Resuscitation Protocols	p. 74
	AED Alarms	p. 74
	Troubleshooting	p. 75

Overview

Defibrillation therapy is the definitive method for termination of lethal arrhythmias. The HeartStart Intrepid optional semi-automated external defibrillation (AED) mode is designed for standard treatment algorithms for cardiac arrest. If your device has this option, the HeartStart Intrepid provides therapy through the application of a brief biphasic pulse of current to the heart. This energy is transferred through disposable multifunction electrode pads applied to the patient's bare chest.

In AED mode, the patient's ECG, SpO₂, pulse, EtCO₂ and AwRR can also be monitored.

Smart Analysis Algorithm

The HeartStart Intrepid uses the Philips SMART Analysis algorithm as the basis for making a shock decision in AED mode. The SMART Analysis algorithm is designed to make aggressive shock decisions for ventricular fibrillation. Ventricular tachycardia rhythms may have an associated pulse, so SMART Analysis is more conservative when making shock decisions with these rhythms.

Shock advisory algorithm sensitivity meets AAMI DF39 requirements and AHA recommendations:

- **Adult:** Ventricular Fibrillation: 90% with lower confidence limit (LCL) of 87%.
Polymorphic Ventricular Tachycardia and Ventricular Flutter: 75% with LCL of 67%.
- **Infant/Child:** Ventricular Fibrillation: 90% with LCL of 87%.
- **Normal Sinus Rhythm:** 99% with LCL of 97%;
- **Asystole:** 95% with LCL of 92%.
- **Other Non-shockable Rhythms:** 95% with LCL of 88%.

The SMART Analysis algorithm detects and removes internal pacemaker pulses that are 2.5 ms or less in duration so that they are not counted.

Intended Use Population

The AED function is intended for use on:

- Patients 25 kg (55 lb) or over or those 8 years old or over by using the Adult patient category.
- Patients less than 25 kg (55 lb) or under 8 years old by using the Infant/Child patient category.

Related Information

For information related to AED mode:

- For guidance on setting AED configuration choices, see [“Configuration – AED”](#) on page 169.
- For information on annotating, storing, exporting, and printing event information acquired in AED mode, see [“Data Management”](#) on page 179.
- For information on optional SpO₂ and Pulse, CO₂ and AwRR, and CPR meter 2 monitoring in AED mode, see the following sections:
 - [Chapter 8 “Monitoring SpO₂”](#) on page 101.
 - [Chapter 11 “Monitoring Carbon Dioxide”](#) on page 129.
 - [Chapter 13 “Q-CPR”](#) on page 145.

Safety Considerations for AED Therapy

WARNINGS: The AED algorithm is not designed to handle erratic spiking problems caused by a properly or improperly functioning internal pacemaker. In patients with cardiac pacemakers, the HeartStart Intrepid may have reduced sensitivity and not detect all shockable rhythms.

Use only pads that are approved for use with the HeartStart Intrepid. Use of non-approved pads could affect performance and results.

For adults in AED mode, the preferred position of the multifunction electrode pads are the anterior-lateral position shown on the packaging. For infant/child patients, the pads can be in the anterior-posterior position.

Do not allow multifunction electrode pads to touch each other or to touch other ECG monitoring electrodes, lead wires, dressings, etc. Contact with metal objects may cause electrical arcing and patient skin burns during defibrillation and may divert current away from the heart.

During defibrillation, air pockets between the skin and multifunction electrode pads may cause patient skin burns. To help prevent air pockets, make sure the pads completely adhere to the skin. Do not use dried out pads. Do not open pads package until just prior to use.

Never touch the patient or any equipment connected to the patient (including the bed or gurney) during analysis and defibrillation.

Avoid contact between the patient and conductive fluids and/or metal objects such as the gurney.

Medical electrical equipment which does not incorporate defibrillator protection should be disconnected before defibrillation.

NOTES: Successful resuscitation depends on many variables specific to the patient's physiological state and the circumstances surrounding the patient event. Failure to have a successful patient outcome is not a reliable indicator of monitor/defibrillator performance. The presence or absence of muscular response to the transfer of energy during electrical therapy is not a reliable indicator of energy delivery or device performance.

Impedance is the resistance found between each of the defibrillator's pads when applied to the patient's body the device must overcome to deliver an effective discharge of energy. The degree of impedance differs from patient to patient and is affected by several factors including the presence of chest hair, moisture, lotions, and powders on the skin. The low-energy SMART Biphasic waveform is an impedance-compensating waveform that is designed to be effective across a wide range of patients. However, if a **Shock Aborted** message is displayed, check that the patient's skin has been washed and dried and that any chest hair has been clipped. If the message persists, change the pads and/or Therapy cable.

Perform all routine diagnostic tests to verify that voice instructions occur during operational check and according to organizational protocol.

AED View

For an example of AED View, see [Figure 41](#). For descriptions of the view components, see [Table 15](#). Only the ECG acquired through multifunction electrode pads is displayed in AED mode. In loud environments, use the display messages in addition to the voice instructions.

Figure 41 **AED View Layout**

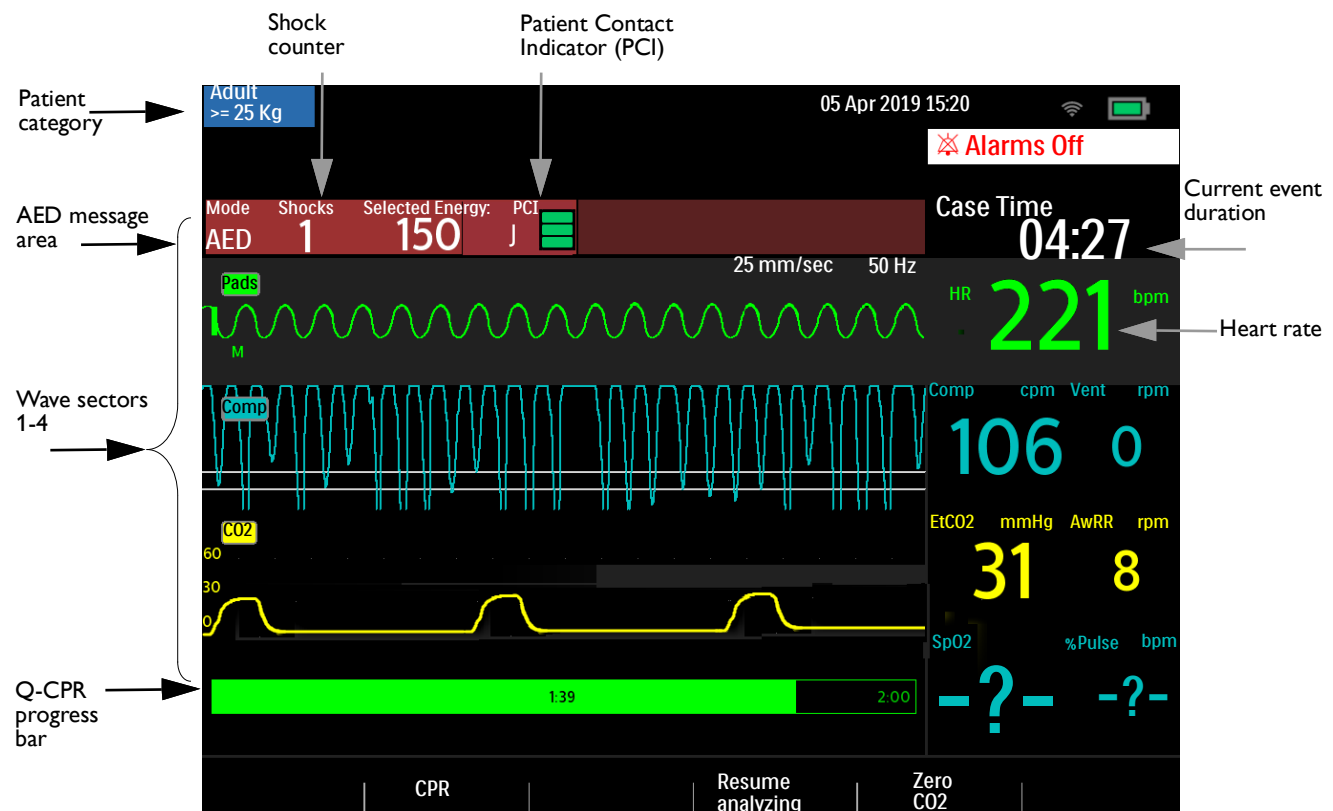


Table 15 **AED View Components**

AED View Display Item	Description
Patient category	Identifies the current patient category. The patient category triggers specific alarm limits and AED energy settings for defibrillation. The background color changes with the selected patient category for Adult (blue) and Infant/Child (pink).
AED message area	Provides important messages for the user while in AED mode.
Wave sectors	- Wave sector 1 displays the primary ECG lead. - Wave sector 2 displays the ECG (annotated or cascaded) or the compression feedback (if using the CPR meter 2), depending on device configuration. - Wave sector 3 displays the Capnogram. - If enabled and available, wave sector 4 displays the SpO₂ waveform or the AED Pause/CPR progress bar.
Shock counter	- Identifies the number of shocks for the current event (including shocks delivered in Manual Defibrillation mode). - After shock delivery, identifies the energy amount that was delivered for the most recent shock, which replaces the shock counter for 15 seconds after the shock is delivered.
Selected energy	Identifies the configured energy for the patient category.
Patient contact indicator (PCI)	Represents the contact quality between the patient and the multifunction electrode pads. The PCI is shown when pads are attached and the device is charging or is charged. Orange or red PCI indicate poor patient contact. Green PCI indicates good patient contact. Adjust pads to optimize patient contact.

AED Soft Keys

For descriptions of the AED Mode soft keys, see [Table 16](#).

Table 16 **AED Soft Key Descriptions**

AED Soft Key	Description
CPR	Initiates the configured pause period to perform CPR.
Resume Analyzing	Initiates the AED analysis algorithm to resume or restart analysis.
Zero CO ₂	Zeros the CO ₂ sensor. Only available when the CO ₂ option is installed and AED CO ₂ monitoring is enabled.
Background Analysis	Initiates No Shock Advised (NSA) monitoring. Only available when the device is configured for NSA monitoring and the NSA pause is activated.

Accessing the AED Main Menu

In AED mode, press the Smart Select knob to view the AED main menu.

Table 17 **AED Main Menu**

Menu Option	Description
Mute CPR Voice / Activate CPR Voice	Silences or activates the AED mode voice instructions.
Voice Volume	Enables you to change the voice volume in AED mode.
Alarm Volume	Enables you to change the volume of AED mode alarms.
ECG Wave Size	Enables you to change the ECG wave size.
Measurements/Alarms	Enables you to change the AED mode alarm limits.
EtCO ₂ Off / On	Enables you to toggle the EtCO ₂ parameter in AED mode.
SpO ₂ Off / On	Enables you to toggle the SpO ₂ parameter in AED mode.
Print Reports	Enables you to print reports of the current event for the current patient.
High Contrast On	Enables you to turn on high contrast for device use in bright sunlight.
Exit	Exits the menu.

Using AED Mode to Defibrillate

WARNING: Defibrillation and CPR may cause myocardial injury to the patient.

Preparation

- ☉ To prepare for defibrillation in AED mode:
 - 1 Confirm that the patient has both of the following symptoms:
 - Patient is not breathing normally or is making gasping sounds
 - Patient does not respond when shaken
 - 2 Expose the patient's bare chest. Wipe moisture from the patient's chest and, if necessary, clip or shave excessive chest hair.
 - 3 Connect the Therapy cable to the HeartStart Intrepid. (See "[Connecting the Therapy Cable](#)" on page 10.)
 - 4 Insert the multifunction electrode pads connector into the end of the Therapy cable.
 - 5 Ensure that the multifunction electrode pads are not expired or damaged and that the package is not damaged.
Discard expired or damaged multifunction electrode pads.
 - 6 Remove the multifunction electrode pads from their packaging.
 - 7 Apply the multifunction electrode pads to the patient as directed on their packaging or according to your organization's protocol.

CAUTION: Aggressive handling of multifunction electrode pads in storage or prior to use can damage the pads. Discard the pads if they become damaged.

Operation

☉ To operate the HeartStart Intrepid in AED mode:

- 1 Turn the Therapy knob to AED. The HeartStart Intrepid announces and displays the current patient category.

If not correct, use the Patient Category button  to select the appropriate patient category.

- For patients 25 kg (55 lb) or over or those 8 years old or over, use the Adult patient category.
- For patients less than 25 kg (55 lb) or under 8 years old, use Infant/Child patient category.

Make sure to properly select patient and pads category. If the age is not known, use your judgment of the patient's weight.

- 2 Follow the voice and screen prompts.
- 3 Press the orange Shock button if prompted.

See the following sections for more information.

NOTES: In AED mode, previously set alarms and scheduled NBP measurements are indefinitely paused, and entry of patient information (with the exception of patient category) is disabled. Additionally, the Sync, Lead Select, and Alarm buttons are inactive.

In AED mode, the ECG acquired through pads is displayed. If the CO₂ or SpO₂ options are available, the numeric and related waveform is also displayed.

Step 1 – Turn the Therapy Knob to AED

When the HeartStart Intrepid is turned to AED, it announces and displays the patient category.

If necessary, press the Patient Category button  to change the patient category.

The device also checks whether the Therapy cable and multifunction electrode pads are properly connected:

- If the therapy cable is not properly connected, a prompt and graphic illustration to **Plug in Connector** with a **Connect Pads Cable** display on the screen.
- If the multifunction electrode pads are not connected to the Therapy cable, pads are not applied to the patient, or pads are not making proper contact with the patient's skin, a message and prompt alert you to insert the connector and apply pads.

Follow the audio and visual prompts to correct the issues. When properly connected, AED mode automatically begins shock analysis. If the patient category is changed when shock analysis is in progress, you do not need to abort the analysis in progress and restart a new one. The algorithm is not sensitive to patient category.

Step 2 – Follow Screen and Voice Instructions

Once an ECG is detected through the multifunction electrode pads, the HeartStart Intrepid warns to not touch the patient and automatically analyzes the patient's heart rhythm.

NOTE: The AED algorithm only looks at the ECG for analysis. It does not use any other data, even if the option is active in AED mode.

WARNING: Handling or transporting the patient during ECG rhythm analysis can cause an incorrect or delayed diagnosis. Under these circumstances, if the HeartStart Intrepid issues a **Shock Advised** command, keep the patient as still as possible for at least 10 seconds so the device can reconfirm the rhythm analysis before pressing the orange Shock button to deliver a shock.

The shock analysis may provide the following messages and prompts:

- **Shock Advised.** If a shockable rhythm is detected, the HeartStart Intrepid automatically charges to the preconfigured Joule setting for the selected patient category. Charging is accompanied by voice and screen prompts. When the device is fully charged, a steady high-pitched tone sounds, and the orange Shock button flashes.

Heart rhythm analysis continues while the HeartStart Intrepid charges. If a rhythm change is detected before the shock is delivered, and a shock is no longer appropriate, the defibrillator disarms itself.

NOTE: When fully charged, disarm the device at any time by turning the Therapy knob off the AED position. Resume AED monitoring by turning the Therapy knob back to AED.

- **No Shock Advised (NSA).** If a shockable rhythm is not detected, the HeartStart Intrepid audibly advises **No shock advised**. Follow the institution's protocol for a No Shock Advised alert. The device's next steps are determined by the **NSA Action** configuration choice. If the configuration is set to:
 - **NSA Monitor.** The HeartStart Intrepid monitors the ECG and automatically resumes analysis if a potentially shockable rhythm is detected. Periodically prompts indicate to press [CPR] soft key and to begin CPR if indicated. The frequency of these prompts is defined in the **NSA Monitor Prompt Interval** configuration choice. Press [CPR] to suspend monitoring and administer CPR any time.
 - **NSA CPR.** Analysis is suspended for the specific period which is defined by the **NSA Action** configuration choice. Attend to the patient and administer CPR if indicated. The Pause Status Bar is displayed. At the end of the pause period, the HeartStart Intrepid resumes analyzing.
- **ECG cannot be analyzed.** If an artifact interferes with analysis, the HeartStart Intrepid provides an alert to attempt to continue analyzing. If artifact persists and device announces that the ECG cannot be analyzed, it enters a pause period.

While paused, analysis is suspended. Check that the pads are making proper contact with the patient's skin and minimize movement. Analysis resumes automatically in 30 seconds or when pressing the [Resume Analyzing] soft key. Always use the analyze function to determine if a rhythm is shockable.

For more information on AED messages, see [“AED Mode User Messages”](#) on page 70.

Step 3 – Press Shock Button if Prompted

Once charging is complete, the HeartStart Intrepid audibly prompts to **Deliver shock now**. Make sure no one is touching the patient or anything connected to the patient. Call out clearly and loudly “Stay Clear!” Then press the flashing orange Shock button to deliver a shock to the patient.

If you do not deliver the shock when prompted, the shock automatically disarms after 30 seconds and the HeartStart Intrepid enters a pause period for CPR. The device resumes analyzing at the end of the pause period or when pressing the [Resume Analyzing] soft key. Rhythm monitoring is intended to provide a backup or secondary measure of potentially shockable rhythms in various environments but is not a substitute for being attentive to the patient's state.

WARNINGS: The Shock button must be pressed to deliver a shock. The HeartStart Intrepid does not automatically deliver a shock.

Defibrillation current can cause operator or bystander injury. Do not touch the patient or equipment connected to the patient during defibrillation.

Delivery of the shock is confirmed by an **Attend to Patient, Shock Delivered** display message and the shock counter is updated to reflect the number of shocks given. The defibrillator then announces **Begin CPR** and enters the configured CPR timer period. Voice instructions may be configured to be brief or detailed. Analysis begins again at the end of the pause period or when pressing the **[Resume Analyzing]** soft key. If switching to Manual Defibrillation during the CPR pause period, the device continues the CPR period. If switching to Monitor or Pacer modes, the CPR pause period exits.

AED Mode User Messages

AED mode provides voice instructions and display messages through the defibrillation process. Some voice prompts may use long or short versions, as determined by the voice prompt parameter of your AED configuration.

Informational Messages

Informational messages may appear during normal AED mode operation. AED mode voice and display prompts are consistent with the most recent American Heart Association (AHA) and European Resuscitation Council (ERC) guidelines.

Table 18 AED Mode Informational Messages

Audio Message	Display Text	Condition	User Action
Adult Mode	Patient Type: Adult	The current AED mode patient category is Adult.	None
Infant/Child Mode	Patient Type: Infant/Child	The current patient category is Infant/Child.	
Low battery	None. See battery icon in upper right of the display.	The battery charge level is low.	Charge or replace the battery.

Pad Connection Messages

Pad connection messages may appear when the Therapy or Pads/CPR meter 2 cable is not connected properly to the device or the pads are not applied properly to the patient.

Table 19 AED Mode Pad Connection Messages

Audio Message L = Long prompt. S = Short prompt. Not noted = Both.	Display Text	Condition	User Action
“Plug In Connector”	Connect Pads Cable	The cable is not connected to the device.	Securely connect the Therapy cable or Pads/CPR meter 2 cable to the device.
	Connect Pads/CPR Cable		

Table 19 **AED Mode Pad Connection Messages (Continued)**

Audio Message L = Long prompt. S = Short prompt. Not noted = Both.	Display Text	Condition	User Action
None	Disconnect Paddles Cable	A paddles cable is connected to the device.	Disconnect the paddles and attach the Pads/CPR meter 2 or Therapy cable to the device.
• “Apply pads” (S) • “Apply pads to patient’s bare chest” (L) • “Look carefully at the screen for infant/child pad placement” • “Apply pads as shown on screen” • “Apply first pad to child's chest” • “Apply second pad to child's back” • “Insert connector firmly” (S)	Insert Connector, Apply Pads	The pads are not applied or applied incorrectly.	Observe the graphics and follow the voice instructions.
• “Press pads firmly to patient's bare skin” • “Pads must not be touching clothing or each other” • “If needed remove hair from patient's chest” • “Be sure pads connector is completely inserted”	Press Pads Firmly	The pads impedance is too high or too low.	
• “Poor pads contact” • “Replace pads”	Poor Pads Contact		

Analysis-Related Messages

Analysis-related messages may appear during patient analysis.

Table 20 **AED Mode Analysis-Related Messages**

Audio Message	Display Text	Condition	User Action
“Stay clear of patient” pause “Analyzing” pause “Stay clear”	Stay Clear of Patient, Analyzing	Analysis in progress.	None. Wait for further guidance.
“Shock advised” pause “Stay clear”	Stay Clear of Patient, Shock Advised	Shockable rhythm detected.	
“Analyzing interrupted” pause “Stay clear of patient” pause “Stop all motion”	Stay Clear of Patient, Analyzing Interrupted	Artifact detected, analyzing interrupted.	Stop moving or touching the patient.
“Cannot Analyze”	Cannot Analyze	Artifact detected. 45 seconds and device unable to provide a shock determination.	Attend to the patient
“No shock advised”	Attend to Patient, No Shock Advised	No shockable rhythm detected.	
“Begin CPR”	Press the CPR Button and Begin CPR	Pads off or impedance too high or low.	Begin CPR
	Begin CPR	Shock delivered.	
	Attend to Patient	No shock advised.	
“Stop CPR”	None	CPR pause period exit	Pause CPR

Shock-Related Messages

Shock-related messages may appear during normal AED therapy delivery.

Table 21 **AED Mode Shock-Related Messages**

Audio Message	Display Text	Condition	User Action
“Deliver shock now”	Deliver Shock Now	Shock advised	Call out “Stay Clear,” ensure no one is touching the patient, and press the flashing orange Shock button.
“Press the flashing orange button now”	Press Orange Button		

Table 21 **AED Mode Shock-Related Messages (Continued)**

Audio Message	Display Text	Condition	User Action
None	Attend to Patient, Shock Delivered	The final shock in a shock series has been delivered.	Attend to patient.
	Stay Clear of Patient, Shock Delivered	A shock in an ongoing shock series has been delivered.	Stay clear of patient.
“Shock delivered”	None	A shock has been delivered.	Attend to patient.
“Shock cancelled” “No shock advised”	Shock Cancelled	Shock reversal	Attend to patient.
“Shock cancelled” “Press pads firmly to patient's bare skin”		Shock aborted due to high impedance	Check the pads.
“Shock cancelled” “Pads must not be touching clothing or each other”		Shock aborted due to low impedance	
“Shock button not pressed”	Charge Cancelled	Charge timeout	Press [Resume Analyzing] and attend to patient.
“Press pads firmly to patient's bare skin”	None	Poor pads contact	Check the pads.

Using AED Mode to Monitor

You can monitor the patient's ECG, SpO₂, pulse, EtCO₂ and AwRR in AED mode. Related alarms can also be activated for the parameters.

☉ To monitor ECG in AED mode and activate alarms:

- 1 Turn the Therapy knob to AED. The HeartStart Intrepid announces the patient category currently set. If necessary, use the Patient Category button  to change the patient category.
- 2 After performing an initial ECG rhythm analysis, if the rhythm is not shockable, the HeartStart Intrepid begins to monitor the patient.
- 3 To activate ECG alarms in AED mode, press the Alarms button on the front of the device.

☉ To monitor optional SpO₂ and pulse in AED mode and activate alarms:

- 1 Once in AED mode, attach an SpO₂ line to the device and patient. For more information, see [“Applying the Sensor”](#) on page 103.
- 2 If the device is configured to monitor SpO₂ in AED mode, SpO₂ monitoring begins once a pulsatile reading is obtained. For more information, see [Chapter 8 “Monitoring SpO₂”](#) on page 101.
- 3 To activate the SpO₂ alarms in AED mode, press the Alarms button on the front of the device.

- ☉ To monitor optional EtCO₂ and AwRR in AED mode and activate alarms:
 - 1 Once in AED mode, attach a CO₂ line to the device and the patient. For more information, see [“Connecting the CO2 Filter Line”](#) on page 13.
 - 2 If the device is configured to monitor CO₂ in AED mode, CO₂ monitoring begins once a reading is obtained.
 - 3 To activate the EtCO₂ alarms in AED mode, press the Alarms button on the front of the device.

Configurable Resuscitation Protocols

AED mode has the flexibility to configure the HeartStart Intrepid to match institutional resuscitation protocols as follows:

- Customize the device for the number of shocks (1-4) in a series.
- Select the energy setting within a given shock series (Adult patient category only).
- Set the CPR Pause interval from 1-3 minutes.
- Select the level of detail for the voice instructions in AED mode.
- Select what the device does after a No Shock Advised decision.
- Enable and disable the SpO₂ and EtCO₂ monitoring during AED.

For more information, see [Table 60 “Configuration – AED”](#) on page 169.

AED Alarms

The Philips SMART Analysis algorithm generates AED defibrillation alarms for the conditions shown in [Table 22](#). There are both audio and visual alerts.

When monitoring a patient, the Philips ST/AR ECG Monitoring Algorithm generates ECG alarms in AED mode.

-
- WARNING:** To prevent the negligence of alarm conditions that may lead to patient harm or death, ensure that you are aware of all active alarms when changing from a clinical mode to AED mode:
- Some alarms that were active in the prior clinical mode may not be shown in AED mode, even though the alarm condition is still active.
 - When changing from AED mode back to a clinical mode, alarms are restored for active alarm conditions.
-

Table 22 **AED Defibrillation Alarms**

Display Text	Condition	Type of Alarm
Abnormal Shock Dose Delivered	Abnormal shock dose due to marginal patient impedance.	High priority latching
Pads/Paddle Type Unknown	The device detected a change in paddles or pads type, or the therapy cable identification is invalid.	
Shock Aborted	Shock aborted due to abnormal impedance.	
Therapy Disabled: Run OpCheck	Equipment failure.	
Pads Off	Pads connection problem.	High priority non-latching

Other Alarms in AED Mode

ECG

If ECG alarms are turned on in AED mode, all technical alarms listed in [“Heart Rate and Arrhythmia Technical Alarms”](#) on page 60 and the following physiological alarms from [“Heart Rate and Arrhythmia Physiological Alarms”](#) on page 59 are generated when the condition exists:

- Asystole
- Extreme Tachy
- HR High
- VFib/VTach
- Extreme Brady
- HR Low

Once generated, all alarms appear as messages in the HR alarm status area above the HR numeric. There are both audio and visual alerts. For more information on ECG alarms, see [“Arrhythmia Monitoring”](#) on page 56.

SpO₂ and Pulse

If SpO₂ and Pulse alarms are turned on, once generated, the alarm messages appear in the SpO₂ or Pulse status area above their respective numeric. For more information on these alarms, see [“Enabling/Disabling SpO₂ and Pulse Alarms”](#) on page 107.

CO₂ and AwRR

If EtCO₂ or AwRR alarms are turned on, once generated, the alarm messages appear in their respective status areas above the numeric. For more information on these alarms, see [“EtCO₂ and AwRR Alarms”](#) on page 134.

Troubleshooting

If your HeartStart Intrepid does not operate as expected during AED mode, see [“Defibrillation and Pacing Problems”](#) on page 229.

If there is a delay in delivering therapy, start CPR if indicated.

NOTES

[illegible]

Manual Defibrillation and Cardioversion

This chapter explains how to prepare for and perform asynchronous and synchronous (cardioversion) defibrillation using multifunction electrode pads, external paddles, and internal paddles.

This chapter is divided into the following major sections:

	Overview	p. 77
	Safety Considerations	p. 78
	Code View	p. 79
	Viewing an ECG with External Paddles (Quick Look)	p. 80
	Preparing for Defibrillation	p. 81
	Defibrillation	p. 83
	Synchronized Cardioversion	p. 84
	Manual Defibrillation and Cardioversion Alarms	p. 89
	Troubleshooting	p. 89

Overview

Defibrillation therapy is the definitive method for termination of lethal arrhythmias. The HeartStart Intrepid provides this therapy through the application of a biphasic pulse of current to the heart. This electrical energy is transferred through attached paddles or disposable multifunction electrode pads applied to the patient's bare chest. Internal paddles for open-chest intrathoracic defibrillation can also be used.

In Manual Defibrillation mode, the entire defibrillation process is under user control: Assess the ECG, decide if defibrillation or cardioversion is indicated, select the appropriate energy, charge the HeartStart Intrepid, and deliver the shock. Messages on the display provide relevant information throughout the process. Be attentive to these messages when displayed.

Monitoring alarms are available in Manual Defibrillation mode, but they are turned off by default.

To activate alarms, press the Alarm button . Alarms are reactivated once the Therapy knob is moved to Monitor, an energy setting or Pacer or the Sync button is pressed.

Intended Use Population

Manual defibrillation and synchronized cardioversion are intended for use on:

- Patients 25 kg (55 lb) or over or those 8 years old or over by using the Adult patient category.
- Patients less than 25 kg (55 lb) or under 8 years old by using the Infant/Child patient category.

Safety Considerations

WARNINGS: Do not use Manual Defibrillation mode if not trained in advanced life support.

Incorrect timing of synchronized cardioversion could occur if the patient has an internal pacemaker with pacemaker tails large enough to be detected as an R-Wave.

Defibrillating asystole can inhibit the recovery of natural pacemakers in the heart and completely eliminate any chance of recovery. Asystole should not be routinely shocked. Begin CPR.

Remain attentive to the patient during the delivery of therapy. Delay in delivering a shock may result in a rhythm that was identified as shockable converting spontaneously to non-shockable and could result in inappropriate shock delivery.

Keep hands and feet clear of the paddle electrode edges. Using thumbs, press the shock buttons on the paddle handles.

Use only pads that are approved for use with the HeartStart Intrepid. Use of non-approved pads could affect performance and results.

Use only approved ECG lead sets and monitoring electrodes with the HeartStart Intrepid. Failure to do so may introduce noise and result in intermittent **Cannot Analyze ECG** messages.

Do not allow multifunction electrode pads to touch each other or to touch other ECG monitoring electrodes, lead wires, dressings, etc. Contact with metal objects may cause electrical arcing and patient skin burns during defibrillation and may divert current away from the heart.

Make sure to properly select patient and pads category. If the age is not known, use your judgment of the patient's weight.

When monitoring neonatal ECGs, inaccurate measurements and alarms could result because of differences in the characteristics of the adult ECG compared to the neonatal ECG.

During defibrillation, air pockets between the skin and multifunction electrode pads may cause patient skin burns. To help prevent air pockets, make sure the pads completely adhere to the skin. Do not use dried out pads. Do not open pads package until just prior to use. Do not use medical gels or pastes of poor electrical conductivity on external paddles.

Never touch the patient or any equipment connected to the patient (including the bed or gurney) during defibrillation. Avoid contact between the patient and conductive fluids and/or metal objects such as the gurney.

When performing cardioversion through external paddles, do not use paddles as the monitoring lead in wave sector 1. Artifact introduced by paddle movement may resemble an R-Wave arrow and trigger a defibrillation shock. Use external paddles as a monitoring lead for Synchronized Cardioversion only if no other lead source is available and an emergency situation exists.

Medical electrical equipment which does not incorporate defibrillator protection should be disconnected during defibrillation.

CAUTION: Do not allow the paddles to touch each other when discharging a shock. Failure to do so can damage the paddles.

NOTES: Successful resuscitation depends on many variables specific to the patient's physiological state and the circumstances surrounding the patient event. Failure to have a successful patient outcome is not a reliable indicator of monitor/defibrillator performance. The presence or absence of muscular response to the transfer of energy during electrical therapy is not a reliable indicator of energy delivery or device performance.

Defibrillation is always performed through paddles or pads. However, during defibrillation it is possible to monitor the ECG using an alternate ECG source (3-, 5-, or 10-lead monitoring electrodes). If an alternate ECG source is connected, any available lead may be displayed.

Leads off Sensing and PCI sensing for pads/paddles: Apply 500 nA rms (571 Hz); 200 μ A rms (32 kHz).

Code View

In Manual Defibrillation mode, when an energy is selected, Code View is displayed. Code View provides information associated with a resuscitation event. For an example of information in Code View, see [Figure 42](#). For descriptions of the view components, see [Table 23](#).

Figure 42 Code View Layout

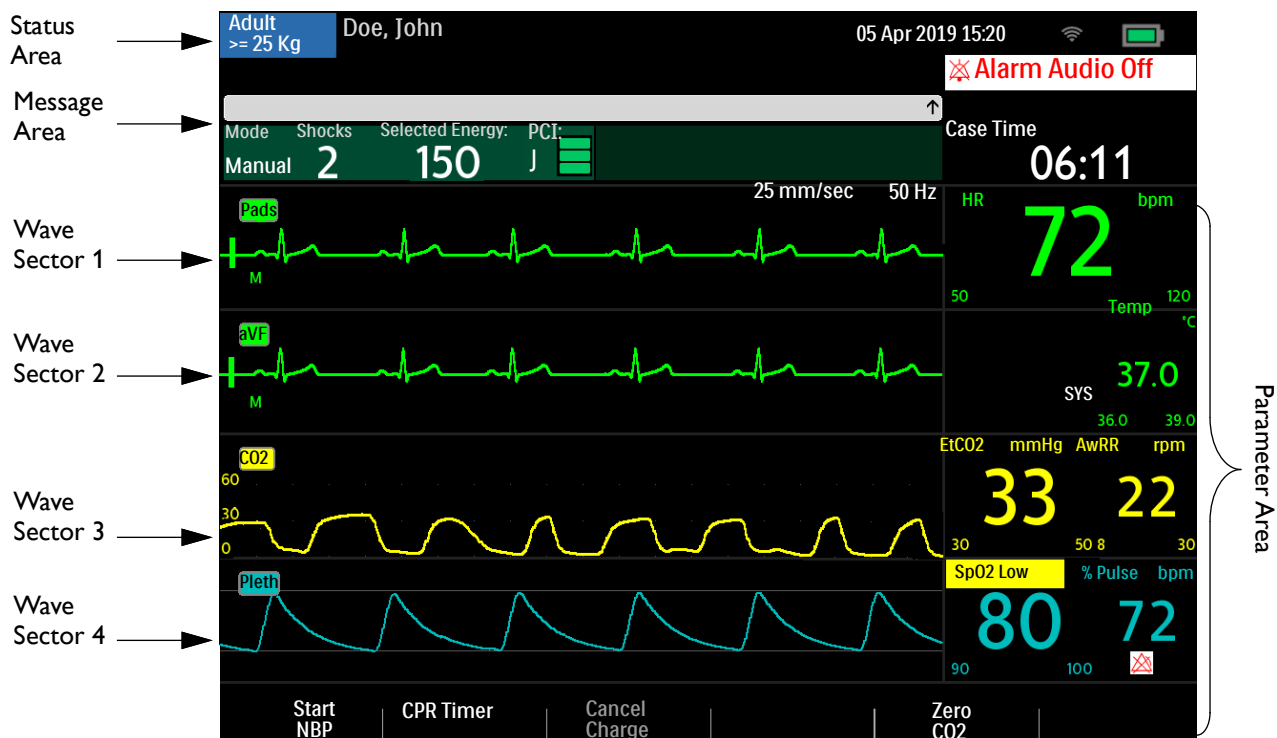


Table 23 Code View Components

Manual Mode Code View Components	Description
Patient category	Identifies the current patient category. The patient category triggers specific alarm limits and AED energy settings for defibrillation. The background color changes with the selected patient category for Adult (blue) and Infant/Child (pink).
AED message area	Provides important messages for the user while in AED mode.
Wave sectors	- Provides the currently configured waveform. If Cascade is selected, depending on the ECG size, parts of the wave may be clipped due to the smaller sector size. - When the [CPR Timer] soft key is pressed, the wave in wave sector 4 is replaced with the CPR Progress bar. This tracks the progress of the CPR pause period.
Shock counter	- Identifies the number of shocks for the current event (including shocks delivered in Manual Defibrillation mode). - After shock delivery, identifies the energy amount that was delivered for the most recent shock, which replaces the shock counter for 15 seconds after the shock is delivered.
Selected energy	Identifies the configured energy for the patient category.
Patient contact indicator (PCI)	Represents the contact quality between the patient and the multifunction electrode pads. The PCI is shown when pads are attached and the device is charging or is charged. Orange or red PCI indicate poor patient contact. Green PCI indicates good patient contact. Adjust pads to optimize patient contact.

Viewing an ECG with External Paddles (Quick Look)

Use external paddles for a “Quick Look” to assess the patient’s ECG rhythm and then, if necessary, deliver therapy. Use this process only when multifunction electrode pads and monitoring electrodes are not immediately available.

WARNINGS Do not rely only on the “Quick Look” reading for diagnostic or therapy decision purposes. Use your medical judgement with the Quick Look feature.

Do not apply the external paddles as long-term ECG electrodes; otherwise, delay and misdiagnosis of treatment may happen.

☉ To view a patient’s ECG using external paddles:

- 1 Make sure the device is turned on to Monitor.
- 2 Apply external paddles to the patient’s chest, minimizing any unnecessary movement.
- 3 After the HeartStart Intrepid detects the ECG, view the waveform on the display.

Preparing for Defibrillation

- ☉ To prepare for defibrillation:
 - 1 Prepare the patient's skin to improve skin contact. See [“Skin Preparation”](#) on page 49.
 - 2 Connect the Therapy cable to the HeartStart Intrepid. See [“Connecting the Therapy Cable”](#) on page 10.
 - 3 Apply paddles or pads as described in the following sections.

Setting Up Multifunction Electrode Pads for Defibrillation

- ☉ To set up for defibrillation using multifunction electrode pads:
 - 1 Ensure that the Therapy cable is connected to the HeartStart Intrepid. See [“Connecting the Therapy Cable”](#) on page 10.
 - 2 Connect the multifunction electrode pads to the Therapy cable. See [“Connecting Multifunction Electrode Pads”](#) on page 11.
 - 3 Apply the multifunction electrode pads to the patient as described on their packaging or according to your organization's protocol.

WARNING: Ensure adhesive pads on the patient are at least 8 cm (3 inches) away from an implantable cardiac device. If necessary, use an alternative position, such as anterior-lateral or posterior-anterior. Failure to do so may damage the implantable cardiac device during defibrillation.

- 4 Follow the defibrillation steps in [“Defibrillation”](#) on page 83.

Setting Up External Paddles for Defibrillation

WARNING: Carefully monitor the patient status during and after use of the external paddles. Treat the patient based on their status.

- ☉ To set up for defibrillation using external paddles:
 - 1 After connecting the paddles cable to the HeartStart Intrepid, remove the paddle set from the paddle tray by pulling the paddles straight up and out of the paddle tray.
 - Confirm the correct size paddles for the patient.
 - Verify there is no debris or residue (including dried electrode gel) on the surface of the paddles. Clean if necessary.
 - 2 Apply conductive matter according to organizational protocol.

WARNING: Do not apply an excessive amount of conductive matter to the external paddles. Excessive conductive matter may introduce low impedance.

CAUTION: Do not distribute conductive matter by rubbing the paddle electrode surfaces together; surfaces could get scratched or damaged.

- 3 Apply the paddles to the patient's bare chest using the anterior-lateral placement (or in accordance with organizational protocol).

WARNING: Do not apply external paddles to an open wound or recent incision site.

- 4 Ensure proper contact of the external paddles on the patient:
 - A green PCI indicates proper patient contact.
 - A red or orange PCI indicates poor patient contact. Adjust the external paddle placement or pressure until the PCI turns green.

NOTE: Depending on the patient's size or other physical factors, you may only be able to achieve an orange PCI. Reasonable effort should be made to obtain at least one green PCI light.

- 5 Follow the defibrillation steps in “Defibrillation” on page 83.

Setting Up Infant Paddles for Defibrillation

The HeartStart Intrepid external paddle set comes with infant paddles included. The American Heart Association recommends using the largest paddles or self-adhering electrodes that fit on the child's chest while still maintaining good separation between the paddles.

- © To set up for defibrillation using infant paddles:
- 1 Expose the infant paddle surfaces, see “Accessing Infant Paddles” on page 17.
 - 2 Store the adult paddle surfaces in the paddle tray pockets.
 - 3 Follow the steps for using external paddles, see “Setting Up External Paddles for Defibrillation” on page 81.
 - 4 Follow the defibrillation steps in “Defibrillation” on page 83.

Setting Up Internal Paddles for Defibrillation

If internal sterilizable paddles are used, check their continuity and confirm that they have not reached their maximum processing cycles before using in an event. See the *Internal Defibrillator Paddles Instructions for Use*.

- © To set up for defibrillation using internal paddles:
- 1 Select the appropriate paddle electrode size.
 - 2 If using switchless internal paddles, connect the paddles to the Internal Paddle Adapter Cable.
 - 3 Connect the paddles cable (or the paddle adapter cable) to the HeartStart Intrepid. See “Connecting the Therapy Cable” on page 10.
 - 4 Follow the defibrillation steps in “Defibrillation” on page 83.

NOTE: The HeartStart Intrepid has a built-in limit of 50 J when using internal paddles.

Defibrillation

Defibrillation has three basic steps: select the defibrillation energy, charge the defibrillator, and shock the patient.

WARNINGS: For manual defibrillation of infant/child patients, follow your organization's policy. Guidelines are 2 to 4 J/kg for the first shock and 4 J/kg per subsequent shocks.

Do not leave patients unattended when the HeartStart Intrepid is in Manual Defibrillation mode with pads applied to the patient.

Alarm audio is turned off when an energy setting is selected for defibrillation, and the **Alarm Audio Off** message is displayed. Audio remains off until turned back on by pressing the **Alarm** button, entering Sync mode, or turning the Therapy knob to **Monitor** or **Pacer**.

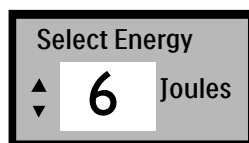
Select the Defibrillation Energy

Turn the Therapy knob to the appropriate energy level for the patient. The recommended energy dose for adult patients is 150 J. Follow your organization's guidelines for infant/child patients. The selected energy is also shown on the screen.

If you turn to 1-10, the **Select Energy** menu appears on the screen:

- To change the individual joule setting in the **Select Energy** menu, turn and press Smart Select knob.
- To access the **Select Energy** menu from the main menu while the Therapy knob is on 1-10, press the Smart Select knob, select **Energy 1-10 Joules**, and press the Smart Select knob again.

Figure 43 **Select Energy Menu**



WARNINGS: Defibrillation and CPR may cause myocardial injury to the patient.

The energy from cumulative shocks may harm the patient. Follow your organization's protocol for selecting defibrillation energy and delivering shocks.

Defibrillation therapy may affect the performance of a patient's implantable cardiac device. Refer to the manufacturer's guidelines for the implantable cardiac device.

Charge the Defibrillator

Press the **Charge** button on the front panel. If using external paddles, the charge button on the side of the apex paddle may be used instead.

As the defibrillator charges, the energy selection shown on the display changes to show the current charge state. The device emits a continuous low-pitch charging tone until the selected energy level is reached and then changes to a continuous high-pitch charged tone.

You may increase or decrease the selected energy at any time during or after charging. The HeartStart Intrepid charges to the selected energy level automatically.

If you need to cancel the charge, press the **[Cancel Charge]** soft key. If the **Shock** button has not been pressed within the time period specified in the **Time to Auto Disarm** configuration setting, the device automatically cancels the charge.

Shock the Patient

Confirm that a shock is still indicated and the defibrillator is charged to the selected energy level. Make sure no one is touching the patient or anything connected to the patient. Call out loudly and clearly: “Stay Clear!”

If using:

- **Pads.** Press the flashing **Shock**  button on the front of the HeartStart Intrepid to deliver a shock.
- **External paddles.** Simultaneously press the flashing Shock buttons located on the paddles to deliver a shock.
- **Switched internal paddles.** Press the orange Shock button located on the paddle to deliver a shock.
- **Switchless internal paddles.** Press the flashing **Shock**  button on the front of the HeartStart Intrepid to deliver a shock.

After a successfully delivered shock, **Begin CPR** is announced and shown on the screen.

WARNINGS: The Shock button must be pressed to deliver a shock. The HeartStart Intrepid does not automatically deliver a shock.

Defibrillation current can cause operator or bystander injury. Do not touch the patient or equipment connected to the patient, during defibrillation.

Synchronized Cardioversion

The HeartStart Intrepid provides synchronized cardioversion therapy by delivering a brief biphasic pulse of electricity to the cardiac muscle immediately following an R-wave detected in the ECG measurement. The SMART Biphasic waveform utilized in the HeartStart Intrepid has undergone clinical testing demonstrating its effectiveness for cardioversion of certain atrial and ventricular arrhythmias. Cardioversion should only be delivered by qualified healthcare professionals trained in Advanced Life Support (ALS).

You can perform synchronized cardioversion in the following ways:

- Using multifunction electrode pads or external paddles with 3, 5, or 12-lead set monitoring electrodes directly connected to the HeartStart Intrepid. This is the best quality source for cardioversion.
- Multifunction electrode pads only, directly connected to the HeartStart Intrepid.

When a patient is already connected to Philips bedside monitoring equipment, the ECG cable must be removed and connected to the HeartStart Intrepid. An external ECG output cable can be plugged into the ECG port of the HeartStart Intrepid and then connected to the bedside monitor's ECG port. This allows the ECG signal from the HeartStart Intrepid to display onto the bedside monitor. The ECG signal from the bedside monitor should never be routed to the HeartStart Intrepid.

Preparation

WARNINGS: Do not change the energy level while pressing the Shock button.

Do not use an external monitor as an ECG source.

CAUTION: If the patient has a noisy or poor ECG signal, use your clinical judgement when deciding whether to perform demand pacing or synchronized cardioversion.

☉ To prepare for synchronized cardioversion:

- 1 Perform tasks as described in “Preparing for Defibrillation” on page 81.
- 2 If monitoring through a 3-, 5-, or 12-Lead ECG cable, plug the ECG cable into the ECG port on the HeartStart Intrepid and apply monitoring electrodes to the patient (see “Lead Selection Criteria” on page 53“).
- 3 Use the Lead Select button  to select the desired waveform in Wave Sector 1. The selected ECG source should have the following qualities to be accurately detected:
 - A clear signal and a QRS complex that is taller than any other complexes in the ECG waveform. The QRS complex should be tall and narrow (recommended amplitude > 0.5 mV).
 - The R-Wave should be above or below the baseline but not biphasic.
 - The P-Wave should be smaller than 1/5 R-wave height.
 - The T-Wave should be smaller than 1/3 R-wave height.

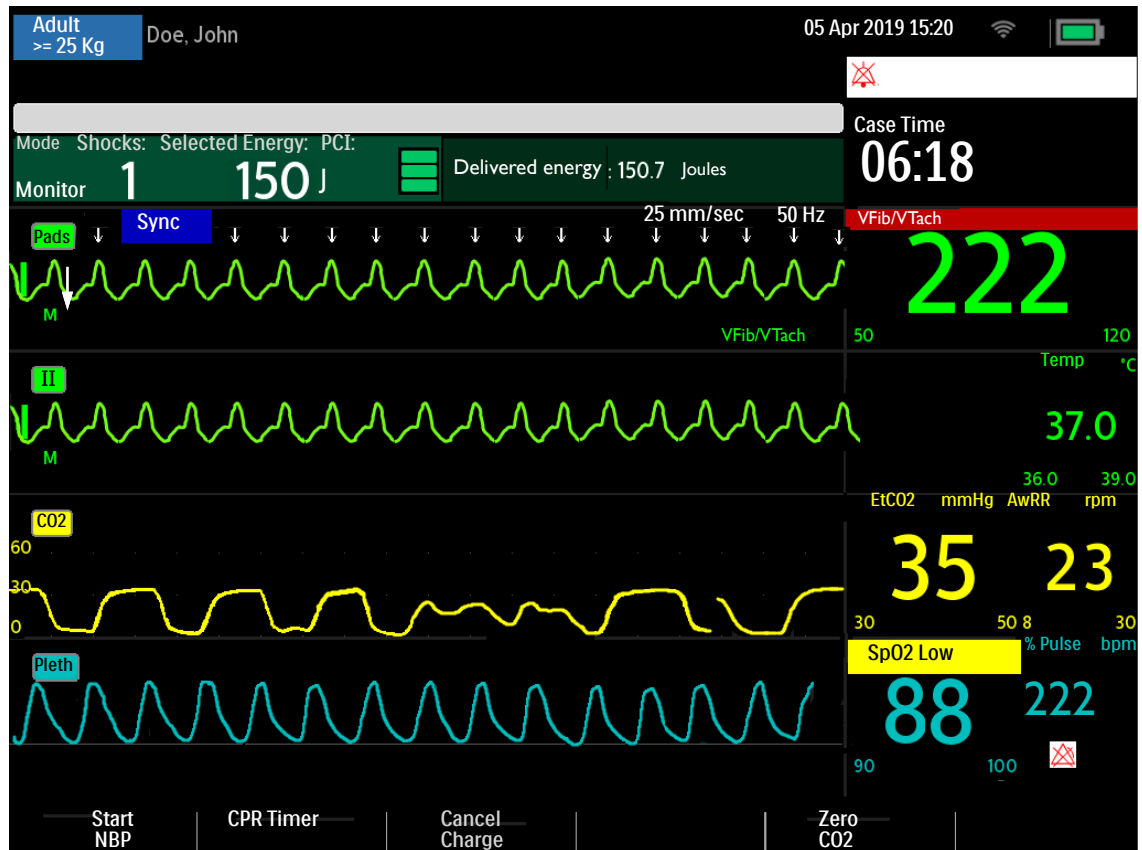
NOTES: Use external paddles as the monitoring lead only if no other lead source is available.

When a patient is already connected to Philips bedside monitoring equipment, the ECG cable must be removed and connected to the HeartStart Intrepid. An external ECG output cable can be plugged into the HeartStart Intrepid's ECG port and then connected to the bedside monitor's ECG port. This allows the ECG signal from the HeartStart Intrepid to display onto the bedside monitor. The ECG signal from the bedside monitor should never be routed to the HeartStart Intrepid.

Code View and Cardioversion

When Synchronized Cardioversion is active, Code View adds R-Wave arrows and a Sync notification to the display. The Sync button is also backlit. See [Figure 44](#).

Figure 44 Cardioversion View Layout



Delivering a Synchronized Shock

WARNINGS: Observe the ECG waveform to ensure that only R-Waves are being labeled with an arrow. If there is any question as to which beats are being labeled as R-Waves in the ECG waveform, do not proceed with shock delivery. Shocks delivered on ECG waves other than the R-Wave can result in a life-threatening rhythm.

The **Shock** button must be pressed to deliver a shock. The HeartStart Intrepid does not automatically deliver a shock.

Defibrillation current can cause operator or bystander injury. Do not touch the patient or equipment connected to the patient during defibrillation.

- ◎ To perform synchronized cardioversion:
 - 1 Turn the Therapy Knob to the energy setting you want.
 - 2 Press the **Sync** button on the HeartStart Intrepid.

- 3 Confirm that the **Sync** button lights up, the **Sync** indicator is present, and R-Wave arrows appear only with each R-Wave.
R-Wave arrows do not always appear at the peak of the R-Wave, but should always appear on the R-Wave.
 - a If waves other than R-waves are being labeled with an arrow, use the Lead Select button  to change leads.
 - b If the R-Wave arrows still appear on any other waves than the R-Wave, move the ECG electrodes to another location on the patient's body.
 - c Re-confirm that only the R-Waves are being marked with arrows before proceeding.
 - d If there is any question as to which beats are being labeled as R-Waves in the ECG waveform, do not proceed with shock delivery. Turn the Sync button OFF and provide asynchronous manual defibrillation under the direction of a physician or physician-authorized personnel.
- 4 Press the yellow **Charge** button on the HeartStart Intrepid, or, if using external paddles, the yellow charge button located on the apex paddle.
 - If the HeartStart Intrepid does not detect an ECG lead when Charge is pressed, a message is displayed. Fix the lead problem before pressing again.
- 5 If necessary, you can change the selected energy during or after charging:
 - The HeartStart Intrepid charges to the selected energy level automatically. Wait until the charge reaches the selected energy level before proceeding.
 - Do not change the energy level while holding down the Shock button.
- 6 When the charge level has been reached, ensure that no one is touching the patient or anything connected to the patient. Call out clearly and loudly "Stay Clear".
- 7 Check the ECG and re-confirm the energy dose and waveform.
- 8 Press and hold the **Shock** button on the HeartStart Intrepid, or, if using external paddles, press and hold the orange buttons on both paddles. Continue to hold the **Shock** button (or the paddle buttons) until the shock is delivered. The defibrillator shocks with the next detected R-Wave.
- 9 Once the shock is delivered, release the **Shock** button. The Shock counter increases by one.

NOTES: If an ECG or pads technical alarm occurs while performing synchronized cardioversion, the HeartStart Intrepid does not charge, or, if charged, disarms automatically.

To disarm the defibrillator, press the **[Cancel Charge]** soft key. The defibrillator disarms automatically when the **Shock** button has not been pressed within the configured time period (30, 60, or 90 seconds).

Synchronized Shock with External Paddles

Carefully review the waveform immediately prior to administering synchronized cardioversion and confirm there is a non-paddles wave label.

WARNING: When performing synchronized cardioversion through external paddles, do not use paddles as the monitoring lead in wave sector 1. Artifact introduced by paddle movement may resemble an R-Wave arrow and trigger a defibrillation shock. Use external paddles as a monitoring lead for synchronized cardioversion only if no other lead source is available and there is an emergency situation.

☉ To perform synchronized cardioversion using external paddles:

- 1 Prepare the patient for synchronized cardioversion as directed in [“Preparing for Defibrillation”](#) on page 81.
- 2 Place paddles on the patient’s chest prior to charging the defibrillator.
- 3 Look at the wave label appearing in wave sector 1.
 - a If the label is **Paddles**:
 - Change the monitoring lead in wave sector 1 by pressing the Lead Select button multiple times to cycle through available leads.
 - Confirm a non-paddles monitoring lead appears in wave sector 1. Check for R-Wave arrows.
 - Proceed with the normal protocol for synchronized cardioversion.
 - b If the label is not **Paddles**, proceed with the normal protocol for synchronized cardioversion.

Delivering Additional Shocks

Additional synchronized shocks may be clinically indicated for a patient. The Sync function can be configured to either remain enabled or be disabled after each synchronized shock is delivered. See [Table 59 “Configuration – Defib/Sync”](#) on page 169. Ensure that you understand which configuration is used by your device:

- Intrepid can be configured to remain in Sync mode after delivering a shock so that it can deliver additional synchronized shocks.
- Intrepid can be configured to revert to manual asynchronous shock delivery after delivering each synchronized shock. In this configuration, to remain in Sync mode, the Sync button must be pressed before delivering each synchronized shock.

☉ To deliver additional synchronized shocks:

- 1 Confirm the Sync function is still enabled, the **Sync** button is lit, the Sync indicator is present, and the R-Wave arrows are still visible.
- 2 Repeat steps 4–8 under [“Delivering a Synchronized Shock”](#) on page 86.

Turning Sync Off

To turn the Sync function off, press the **Sync** button again. The button light turns off and Sync indicator is removed from the display.

Manual Defibrillation and Cardioversion Alarms

Defibrillation and cardioversion alarms can be generated for the conditions shown in [Table 24](#). There are both audio and visual alerts when activated by the **Alarms** button. When the patient category is switched, all parameter alarm limits change to the new patient category. These changes are retained when modes are switched.

For more information on alarms, see [“Alarms”](#) on page 37.

Table 24 Manual Defibrillation and Cardioversion Alarms

Alarm Message	Condition	Type of Alarm
Pads Off	With pads in use, the connection between the device and patient has been lost.	High Priority Non-Latching Alarm
Shock Aborted	A shock has been automatically aborted.	High Priority Latching Alarm
Abnormal Shock Dose Delivered	Abnormal shock dose delivered due to marginal patient impedance.	
Pads/Paddle Type Unknown	The device detected a change in paddles or pads type or the therapy cable identification is invalid.	
Therapy Disabled: Run Op Check	Therapy is disabled due to an equipment failure.	
Paddles Power Overload	A power overload has been detected in the paddles	Medium Priority

Troubleshooting

If the HeartStart Intrepid does not operate as expected during manual defibrillation or cardioversion, see [“Defibrillation and Pacing Problems”](#) on page 229.

If there is a delay in delivering therapy, start CPR if indicated.

NOTES

[illegible]

Pacing

This chapter explains the noninvasive transcutaneous pacing option available with the HeartStart Intrepid and describes how to perform pacing.

This chapter is divided into the following major sections:

	Overview	p. 91
	Safety Considerations	p. 92
	Pacing View	p. 92
	Demand Mode Versus Fixed Mode	p. 93
	Preparing for Pacing	p. 93
	Demand Mode Pacing	p. 95
	Fixed Mode Pacing	p. 96
	Defibrillating During Pacing	p. 97
	Pacing Alarms	p. 97
	Troubleshooting	p. 99

Overview

Noninvasive transcutaneous pacing therapy is used to deliver monophasic pace pulses to the heart. Pace pulses are delivered through multifunction electrode pads that are applied to the patient's bare chest. Pacing with paddles is not supported.

While in Pacing mode, the ECG strip and event summary are easily annotated using the **Mark Event** button.

Intended Use Populations

The noninvasive transcutaneous pacing function is intended for use on:

- Patients 25 kg (55 lb) or over or those 8 years old or over by using the Adult patient category.
- Patients less than 25 kg (55 lb) or under 8 years old by using the Infant/Child patient category.

Safety Considerations

WARNINGS: Pacing therapy should only be delivered by trained healthcare professionals.

If pacing is interrupted for any reason, press the **[Start Pacing]** soft key to resume pacing.

Use only approved lead sets when pacing with the HeartStart Intrepid. Failure to do so may introduce noise and result in intermittent **Cannot Analyze ECG** messages.

Pacing must be turned off before defibrillating with a second defibrillator. Failure to do so could damage the HeartStart Intrepid.

NOTES: For treatment of patients with implantable devices, such as permanent pacemakers or cardioverter-defibrillators, consult a physician and the instructions for use provided by the device's manufacturer.

Waveforms, ECG monitoring, measurements and most alarms remain active and retain their settings when transitioning from Monitor or Manual Defibrillation mode to Pacer mode.

Pacing View

Pacing View appears when the Therapy knob is turned to the **Pacer** position. For an example of Pacing View, see [Figure 45](#). For descriptions of Pacing View components, see [Table 25](#).

Pacing View does not indicate whether the patient has an internal pacemaker (as defined by the patient's **Paced Status** in patient information).

Figure 45 **Pacing View Layout**

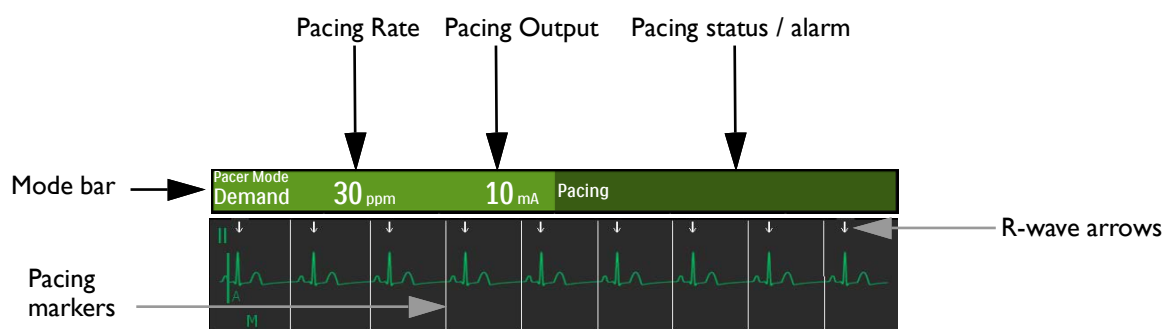


Table 25 **Pacing View Components**

Pacing View Components	Description
Pacing markers	Pacing markers indicate that a pace pulse was delivered and appear in wave sector 1 each time a pacer pulse is delivered. If the wave is cascading, pacing markers appear in wave sector 2.
R-wave arrows	In Demand mode, R-Wave arrows appear in wave sector 1. R-Wave arrows do not appear on paced beats. If the wave is cascading, R-wave arrows appear in wave sector 2.

Table 25 Pacing View Components (Continued)

Pacing View Components	Description
Pacing status (or alarm)	- When the device is on AC/DC power and pacing is active, Pacing is shown. - When the device is on battery power only and pacing is active, Pacing on Battery is shown. - If pacing is not active, Pacing Paused is shown. - If a pacing alarm is present, the alarm message replaces the pacing status.
Pacing mode	Identifies the pacing mode: Demand or Fixed.
Pacing rate	Identifies the current pacing rate, including the unit of measure.
Pacing output	Identifies the current output, including the unit of measure.

Demand Mode Versus Fixed Mode

The HeartStart Intrepid can deliver paced pulses in either **Demand** mode or **Fixed** mode.

- In **Demand** mode, the pacer only delivers synchronous paced pulses when the patient's heart rate is lower than the selected pacing rate.
- In **Fixed** mode, the pacer delivers asynchronous paced pulses at the selected rate.

WARNING: Philips recommends to use Demand mode pacing whenever possible. Fixed mode pacing may be used when artifact or other ECG noise makes R-Wave detection unreliable, when monitoring electrodes are not available, or at your clinical discretion.

The HeartStart Intrepid requires a 3-, 5-, or 10-lead ECG cable and monitoring electrodes as the source of the ECG during Demand mode pacing. Pace pulses are delivered through multifunction electrode pads. However, during Demand mode pacing, the pads cannot be used to monitor ECG and deliver paced pulses simultaneously.

NOTES: The ECG derived from pads does not need to be displayed in a wave sector in order to deliver pacing therapy.

When using the HeartStart Intrepid for pacing in the operating room in the presence of cautery tools, use Fixed mode pacing only.

When using Demand mode pacing, pads are not an available choice for display in wave sector 1, through either the Lead Select button or the Displayed Waves menu.

Preparing for Pacing

☉ To prepare for pacing:

- If not already connected, connect the Therapy cable to the HeartStart Intrepid. See [“Connecting the Therapy Cable”](#) on page 10.
- Prepare the patient's skin to achieve good contact. See [“Skin Preparation”](#) on page 49.

- 3 Connect the multifunction electrode pads. See [“Connecting Multifunction Electrode Pads”](#) on page 11.
- 4 If pacing in Demand mode, apply monitoring electrodes (see [“ECG Electrode Placement”](#) on page 51) and connect the ECG cable to the HeartStart Intrepid (see [“Connecting the ECG cable”](#) on page 15).

WARNING: Do not reverse pad position on the patient. Reversing the pads' positions increases the pacing threshold which means more current is needed to capture the heart, resulting in greater patient discomfort.

NOTES: To help prevent an interruption during pacing therapy from a power or battery failure, ensure the device is connected to AC/DC power and has a charged battery installed.

In Pacer mode, Sync settings are turned off.

If **Paddles** is selected for display in wave sector 1, and the device enters Pacer mode, the wave sector 1 waveform automatically switches to Lead II.

If **Paddles** is selected for display in wave sector 2 and the device enters Pacer mode, the corresponding Wave Sector waveform automatically switches to Cascade.

If **Paddles/Pads** is selected for display in wave sector 3, the device enters Pacer mode, and CO₂ is available, the corresponding wave sector waveform automatically switches to CO₂, otherwise is None.

If **Paddles/Pads** is selected for display in wave sector 4, the device enters Pacer mode, and SpO₂ is available, the corresponding wave sector waveform automatically switches to SpO₂, otherwise is None.

If **Pads** is selected for the display in wave sector 2, and the device enters Demand Mode pacing, the wave sector 2 waveform automatically switches to Cascade.

If monitoring for an extended period of time, monitoring electrodes and multifunction electrode pads may need to be changed periodically. Refer to the electrode manufacturer's documentation for replacement frequency.

Signals from TENS or ESU units can cause interference with the ECG which may impact pacing.

Pace Pulse Duration

Pace pulse duration can be selected in Configuration mode to either 20 or 40 msec. Confirm organizational clinical needs. If 20 msec is selected, available settings range from 10–200 mA. If 40 msec is selected, available settings range from 10–140 mA. See [“Configuration – Pacer”](#) on page 170.

Demand Mode Pacing

☉ To pace in Demand mode:

- 1 Turn the Therapy knob to the **Pacer** position.
The message **Pacing Paused** appears in the Pacing Bar, indicating the pacing function is enabled but pace pulses are not being delivered. Pacing is enabled in Demand mode with the configured lead in wave sector 1 used for R-Wave detection. Note the following:
 - If the configured lead is Pads, then Lead II or the first available monitoring lead is displayed automatically.
 - While in Demand Mode pacing, if the lead is changed in wave sector 1, the HeartStart Intrepid waits a second before notifying you with a Cannot Analyze ECG alarm.
- 2 Press the Lead Select button  to select the best lead with an easily detectable R-Wave.
- 3 Verify white R-Wave arrows appear above or on the ECG waveform. A single arrow should be associated with each R-Wave:
 - If the R-Wave arrows do not appear, are incorrectly labeling beats, or do not coincide with the R-Wave, select another lead.
 - If you used anterior-lateral pad placement and the R-Wave arrows are difficult to read in Lead II, select another lead.
- 4 Press the **[Pacer Rate]** soft key to adjust the rate value.
- 5 Turn the Smart Select knob to change the rate.
- 6 Press the Smart Select knob to confirm the rate.
- 7 Press the **[Start Pacing]** soft key. **Pacing** appears in the Pacing Bar.
- 8 Verify white pacing markers or white R-Wave arrows appear on the ECG waveform.
- 9 Press the **[Pacer Output]** soft key to adjust the output value.
- 10 Turn the Smart Select knob to increase the output until cardiac capture occurs. Capture is indicated by the appearance of a QRS complex after each pacing marker.
- 11 Decrease the output to the lowest level that still maintains capture.
- 12 Assess the patient for a peripheral pulse. (Pulse alarms are automatically turned on.)
- 13 To stop pacing, do one of the following:
 - Press the **[Pause Pacing]** soft key. A prompt message asks to confirm your action. Using the Smart Select knob, select **Yes** to pause pacing; select **No** to continue pacing. Once paused, press the flashing **[Start Pacing]** soft key to resume pacing.
 - Move the Therapy knob away from the **Pacer** position.

WARNINGS: Use care when handling the multifunction electrode pads on the patient to avoid shock hazard during pacing.

Use multifunction electrode pads prior to their expiration date. Discard pads after use. Do not reuse pads. Do not use for more than 8 hours of continuous pacing.

If pacing is interrupted for any reason the **[Start Pacing]** soft key must be pressed to resume pacing.

When pacing in Demand mode, the ECG cable from the patient must be directly connected to the HeartStart Intrepid.

If using the pacing function with battery and the Low Battery alarm sounds, connect the device to external power to avoid interrupted pacing therapy.

CAUTION: If the patient has a noisy or poor ECG signal, use your clinical judgment when deciding whether to perform demand pacing.

NOTES: Pacing does not start if there is a problem with the multifunction electrode pads connection or patient contact. Pace pulses are not delivered if there is a problem with the ECG monitoring electrode connections. If either situation occurs, a system message is displayed.

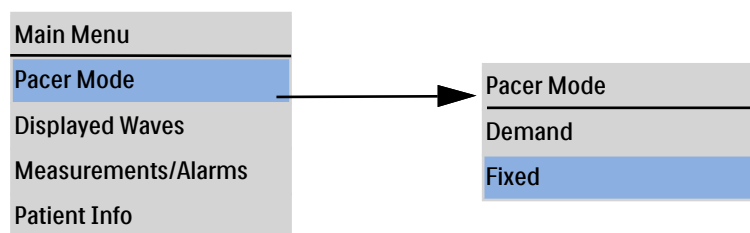
The **[Start Pacing]** soft key is grayed out for Demand Mode pacing until a leads-on condition is detected for the ECG lead used for R-Wave detection and the pads on condition is detected. In Fixed Mode pacing, the soft key is grayed out until pads are detected.

Fixed Mode Pacing

© To pace in Fixed Mode:

- 1 Turn the Therapy knob to the **Pacer** position.
The message **Pacing Paused** appears in the Pacing Bar and indicates the pacing function is enabled but pace pulses are not being delivered. Demand pacing is the default pacer mode.
- 2 Change to Fixed Mode pacing.
 - a Press the Smart Select knob.
 - b Turn the Smart Select knob to highlight **Pacer Mode** and press the Smart Select knob.
 - c Select **Fixed** and press the Smart Select knob.

Figure 46 **Changing Pacer Modes**



NOTE: To view the ECG waveform and related parameters while pacing, ECG electrodes and pads must be on the patient. Viewing pads in wave sector 1 while pacing may give an incorrect heart rate and inappropriate alarms.

- 3 Press the Lead Select button to select the lead for viewing, if one is available.
- 4 Press the **[Pacer Rate]** soft key to adjust the rate value.
- 5 Turn the Smart Select knob to adjust the rate.
- 6 Press the Smart Select knob to confirm the rate.
- 7 Press the **[Start Pacing]** soft key. **Pacing** appears in the Pacing Bar.
- 8 Verify white pacing markers or white R-Wave arrows appear on the ECG waveform.
- 9 Press the **[Pacer Output]** soft key to adjust the output value.
- 10 Turn the Smart Select knob to increase the output until cardiac capture occurs.
Capture is indicated by the appearance of a QRS complex after each pacing marker.

- 11** Decrease the output to the lowest level that still maintains capture.
- 12** Assess the patient for a peripheral pulse. (Pulse alarms are automatically turned on.)
- 13** To stop pacing, do one of the following:
 - Press the **[Pause Pacing]** soft key. A prompt message asks you to confirm your action. Using the Smart Select knob, select **Yes** to pause pacing; select **No** to continue pacing. Once paused, press the flashing **[Start Pacing]** soft key to resume pacing.
 - Move the Therapy knob away from the Pacer position.

WARNINGS: Use care when handling the multifunction electrode pads on the patient to avoid shock hazard during pacing.

Use multifunction electrode pads prior to their expiration date. Discard pads after use. Do not reuse pads. Do not use for more than 8 hours of continuous pacing.

If pacing is interrupted for any reason, press the **[Start Pacing]** soft key to resume pacing.

If you are using the pacing function with battery and the **Low Battery** alarm sounds, connect the device to external power to avoid interrupted pacing therapy.

Defibrillating During Pacing

If there is a need to defibrillate the patient during pacing, refer to the procedure for defibrillation in Manual Defibrillation mode or AED mode. Once the Therapy knob is moved from the **Pacer** position to a Manual Defibrillation mode energy setting or AED, pacing is stopped.

To resume pacing after defibrillation, repeat the pacing procedure as described in “[Demand Mode Pacing](#)” on page 95 or “[Fixed Mode Pacing](#)” on page 96. When pacing is resumed, pacing settings selected prior to defibrillation (mode, rate, and output) are retained. Be sure to confirm cardiac capture has been retained.

WARNING: Pacing must be turned off before defibrillating with a second defibrillator. Failure to do so could damage the HeartStart Intrepid.

Pacing Alarms

Pacing messages and alarms can be generated for the conditions shown in Tables [26](#) and [27](#). Once generated, they appear as alarm messages in the Pacer Bar. There are both audio and visual alerts. When you switch patient categories, all parameter alarm limits change to the new patient category. These changes are retained when you switch modes.

If you are using the pacing function with a battery and the Low Battery alarm sounds, connect the device to external power to avoid interrupted pacing therapy.

WARNING: Observe the patient closely while pacing. Heart rate displays and alarms function during pacing can be unreliable. Do not rely on the indicated heart rate or heart rate alarms as a measure of the patient’s perfusion status.

Table 26 Pacing Messages

Message	Condition	Indication
Press Start Pacing To Start	Knob is set at Pacer , pads are connected to the device and patient, but pacing has not started.	Medium, non-latching
Connect ECG Cable. Attach Leads	No leads or pads detected	
Connect Pads Cable		
Insert Connector, Apply Pads		

Table 27 Pacing Alarms

Alarm Message	Condition	Indication
Pacer Output Low. Check Pads Contact.	The actual delivered pace pulse current is less than the selected output.	Physiological alarm in the HR area
Pacing on Low Battery	The battery charge level is low.	
Pacing Stopped	Pacer mode exited or device turned off.	High priority alarm tone even if alarm audio is disabled. If the condition is resolved, the displayed text becomes Pacing Stopped . Remains latched until the [Start Pacing] soft key is pressed.
Pacing Stopped. Device Error.	An error detected which prevents delivery of pacing therapy.	
Pacing Stopped. Leads Off.	Primary ECG lead has become invalid in Demand mode pacing.	
Pacing Stopped. Pads Cable Off.	Therapy cable is disconnected from the device.	
Pacing Stopped. Pads Off.	Pads Off condition has been detected during pacing.	
Pacing Stopped. Power Interrupted.	Power failure during pacing.	

NOTE: Once the reason for the Pacing Stopped alarm has been resolved, that part of the alarm message is removed from the display. The audio alarm continues. Press the **[Start Pacing]** soft key to resume pacing, remove the remainder of the alarm text from the display and silence the audio alarm.

Troubleshooting

If your HeartStart Intrepid does not operate as expected during pacing, see [“Defibrillation and Pacing Problems”](#) on page 229.

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no vertical margin lines or other markings present.

Monitoring SpO₂

This chapter explains how Pulse Oximetry works and how to use the HeartStart Intrepid to monitor SpO₂.

This chapter is divided into the following major sections:

	Overview	p. 101
	Safety Considerations	p. 101
	SpO₂ Measurement Accuracy	p. 102
	Understanding Pulse Oximetry	p. 102
	Monitoring SpO₂	p. 104
	SpO₂ and Pulse Rate Alarms	p. 105
	Disabling SpO₂ Monitoring	p. 108
	Caring for Sensors	p. 108
	Troubleshooting	p. 108

Overview

Pulse oximetry is a noninvasive method of continuously measuring functional oxygen saturation (SpO₂) in arterial blood. SpO₂ readings indicate the percentage of hemoglobin molecules in arterial blood that are saturated with oxygen.

Intended Use Populations

The SpO₂ function is intended for use on:

- Patients 25 kg (55 lb) or over or those 8 years old or over by using the Adult patient category.
- Patients less than 25 kg (55 lb) or under 8 years old by using the Infant/Child patient category.

The SpO₂ function is not intended for use on a neonate (a child within four weeks of birth).

Safety Considerations

WARNINGS: Do not leave an SpO₂ sensor on a patient undergoing an MRI.

For patients with an intra-aortic balloon pump, assess peripheral pulses according to the institution's protocol.

Verify the compatibility of the monitor, sensor, and cable before use. Otherwise, patient injury may result.

SpO₂ Measurement Accuracy

For accurate SpO₂ measurements, the following conditions apply:

- The patient must have perfusion in that extremity.
- The light emitter and photodetector must be directly opposite each other.
- All of the light from the emitter must pass through the patient's tissue.
- The sensor site should be free of vibration and excessive motion.
- The sensor cable and connector should be positioned away from power cables to avoid electrical interference.

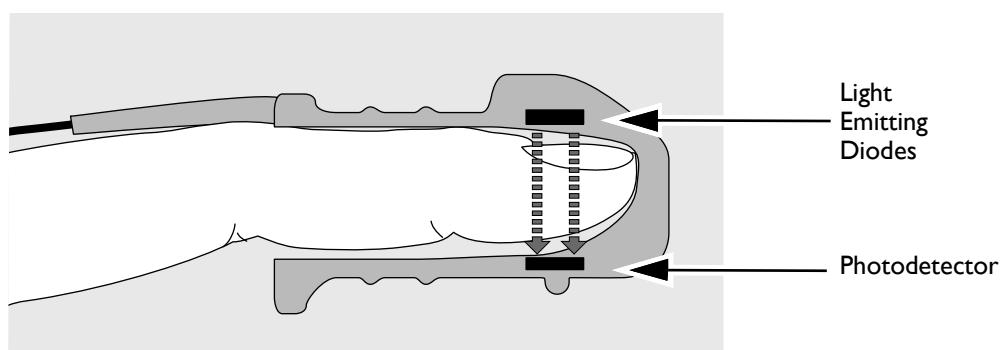
WARNING: Do not rely solely on SpO₂ readings; assess the patient at all times. Inaccurate measurements may be caused by:

- Incorrect sensor application or use
 - Significant levels of intravascular dyshemoglobins such as carboxyhemoglobin or methemoglobin in patient and other disorders of hemoglobin
 - Restricted blood flow to the extremities (such as patients that have poor circulation or are in severe shock or hypothermia)
 - Constrictor medications
 - Photosensitive drugs or acidosis
 - Injected dyes such as methylene blue
 - Exposure to excessive illumination such as surgical lamps (especially those with a xenon light source), bilirubin lamps, fluorescent lights, infrared heating lamps or direct sunlight.
-

Understanding Pulse Oximetry

A pulse oximetry sensor sends light through patient tissue to a receiver on the other side of the sensor. Light-emitting diodes transmit red and infrared light through the peripheral areas of the body such as a finger.

Figure 47 **Pulse Oximetry Sensor**



A photodetector positioned opposite the light emitting diodes compares the light absorption before and after pulsation. The amount of light getting through reflects the blood flow in the arterioles. This measurement of light absorption during pulsation is translated into an oxygen saturation percentage. The SpO₂ value and wave are displayed.

Selecting a Sensor

The most important factor when selecting a sensor is the position of the light emitting diodes in relation to the photodetector. When the sensor is applied, the diodes and the photodetector must be opposite each other. Sensors are designed for patients with a specific weight range and for specific sites. Be sure to:

- Select a sensor appropriate for the patient's weight.
- Select a sensor site with adequate perfusion.
- Avoid application to sites with edematous tissue.

SpO₂ sensors are either reusable or disposable. Reusable sensors can be reused on different patients after they have been cleaned and disinfected (see the manufacturer's instructions supplied with the sensor). Disposable sensors should only be used once and then discarded. They may be relocated to another appropriate site on the same patient but not reused on different patients.

For a list of SpO₂ accessories, see “SpO₂ Cables and Sensors” on page 224.

CAUTIONS: Do not use more than one extension cable.

Do not use the ear transducer on patients with small ear lobes as incorrect measurements may result.

Applying the Sensor

Follow the manufacturer's directions for applying and using the sensor, making sure to observe any warnings or cautions. For best results:

- Make sure the sensor is dry.
- If the patient is moving, secure the sensor cable loosely to the patient.
- Make sure the sensor is not too tight. Too much pressure can cause venous pulsation or can impede blood flow, resulting in low readings.
- Keep power cables away from the sensor cable and connection.
- Avoid placing the sensor in an environment with bright lights. If necessary, cover the sensor with opaque material.
- Avoid placing the sensor on an extremity with an arterial catheter, blood pressure cuff, or intravenous infusion line.

WARNINGS: Failure to apply the sensor properly may reduce the accuracy of the SpO₂ measurement.

Ensure that the SpO₂ probe is properly applied without excessive pressure. A probe that is misapplied with excessive pressure or for prolonged time may cause skin irritation, such as reddening, blistering, or burns.

Inspect the sensor application site at least every two hours for changes in skin quality, correct optical alignment and proper sensor application. If skin quality is compromised, change the sensor site. Change the application site at least every four hours. More frequent checking may be required due to an individual patient's condition.

Do not use a damaged sensor or one with exposed electrical circuits.

Monitoring SpO₂

☉ To monitor SpO₂:

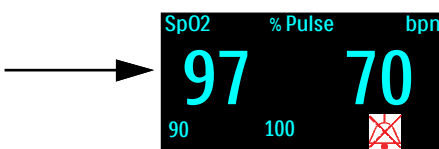
- 1 Connect the appropriate SpO₂ sensor cable to the HeartStart Intrepid.
- 2 Apply the sensor to the patient.
- 3 If the HeartStart Intrepid is not turned on, turn the Therapy knob to a clinical mode.
 - SpO₂ needs to be configured to appear in AED mode and does not display unless it is pulsatile.
- 4 Check that the patient category is appropriate for the patient. If necessary, change the Patient Category to select the appropriate category.

Once the sensor cable is connected, and the device is turned on, an SpO₂ measurement begins. A **-?-** is displayed for the SpO₂ value in the Parameter Area while the oxygen saturation is initially measured and value calculated. In a few seconds, a value replaces the **-?-**.

Pulse Rate: The patient's pulse rate, as derived from pulse oximetry, is displayed in the Parameter Area.

Figure 48 SpO₂ Value

Alarm Limits: If SpO₂ or pulse rate alarms are turned on, the alarm limits are displayed. If alarm limits are turned off, the Alarms Off symbol  is displayed.

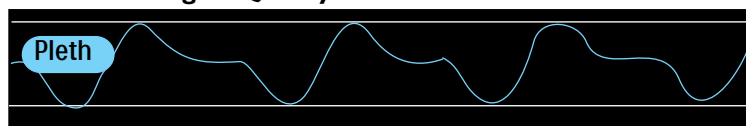


Pleth Wave

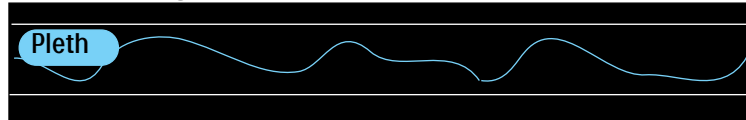
The pleth wave is non-normalized. When the sensor is connected to the HeartStart Intrepid, the pleth wave is displayed in wave sector 4. Grid lines are displayed to indicate signal quality. When the signal quality is good, the pleth wave is auto-scaled to the grid lines. When the signal is poor, the size of the wave is proportionally decreased and appears not to reach the grid lines. The pleth wave in [Figure 49](#) has not been normalized; it shows good and poor quality.

Figure 49 Pleth Waves

Good Pleth Signal Quality



Poor Pleth Signal Quality



SpO₂ and Pulse Rate Alarms

SpO₂ alarms are on by default. Pulse Rate alarms can be turned on or off in all clinical modes when SpO₂ is available. For configuration information, see [Table 55 “Configuration – SpO₂”](#) on page 167.

Alarms activate if measurements fall outside the configured limits for high or low SpO₂, or if the measurement falls below the configured SpO₂ Desat Limit. SpO₂ alarms, except Desat, are non-latching alarms, meaning they are automatically removed when their alarm condition no longer exists. Desat alarms are latching, meaning they remain present even if the alarm condition no longer exists.

SpO₂ alarms can be generated for the conditions shown in [Tables 28 and 29](#). Once generated, they appear as alarm messages in the SpO₂ alarm status area above the SpO₂ numeric. There are both audio and visual alarms. For more information on alarms, see [“Alarms”](#) on page 37.

Table 28 SpO₂ and Pulse Rate Physiological Alarms

Message	Condition	Type	Indication
Desat	The SpO ₂ value has fallen below the Desat low limit.	High Priority Latching Alarm	Red alarm message with audio tone
Pulse High	The Pulse value exceeds the high alarm limit.	Medium Priority Latching Configurable Alarm	Yellow alarm message with audio tone
Pulse Low	The Pulse value has fallen below the low alarm limit.		
SpO ₂ High	The SpO ₂ value exceeds the high alarm limit.		
SpO ₂ Low	The SpO ₂ value has fallen below the low alarm limit.		

Table 29 SpO₂ Technical Alarms

Message	Condition	Type	Indication
SpO ₂ Sensor Malfunction	The device is unable to detect a Pleth waveform due to a SpO ₂ sensor malfunction.	Low Priority Non-Latching Alarm	Cyan alarm message with audio tone
SpO ₂ Unplugged	The SpO ₂ sensor is disconnected.		
SpO ₂ Noisy Signal	A noisy SpO ₂ sensor signal has been detected.		
SpO ₂ Interference	Light interference has been detected at the SpO ₂ sensor.		
SpO ₂ Non-Pulsatile	A non-pulsatile SpO ₂ signal has been detected.		
SpO ₂ Equipment Malfunction	A problem with the SpO ₂ module has been detected.		
SpO ₂ Erratic	An erratic measurement has been detected.		
SpO ₂ Extended Update	The SpO ₂ measurement has not been updated within the last 30 seconds.		
SpO ₂ Low Perfusion	The device has detected low perfusion.		
SpO ₂ Error	A non-critical failure has been detected.		

NOTES: SpO₂ alarms are on in all clinical modes (except AED and Manual) unless specifically turned off or if alarms for the entire device are off. Once disabled, alarms remain off until they are turned back on.

While an NBP measurement is in progress, SpO₂ alarms are suppressed.

SpO₂ Desat Alarm

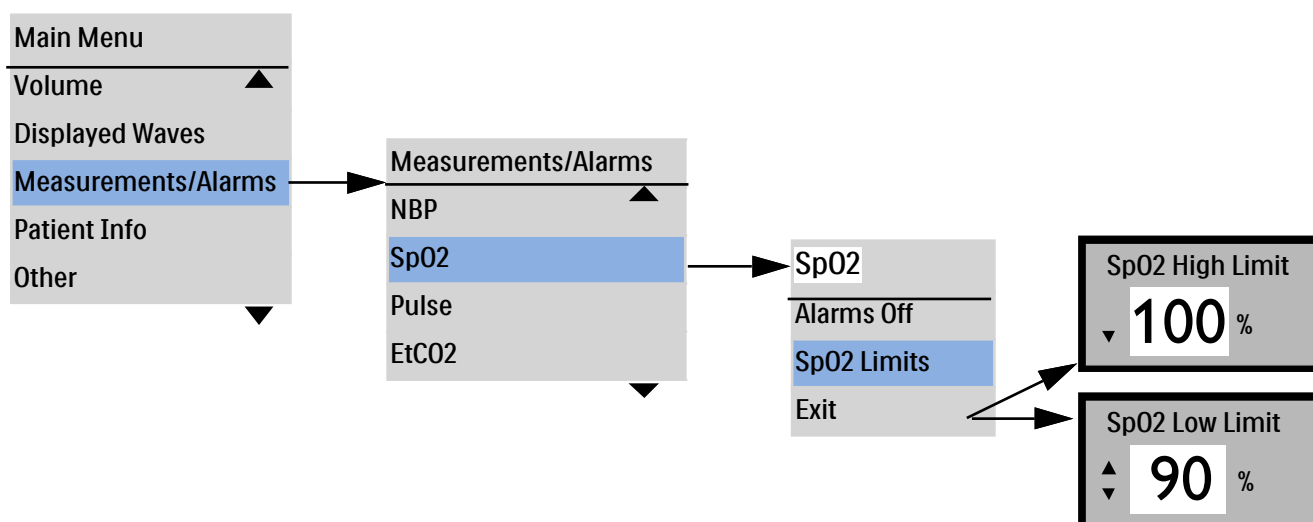
The SpO₂ **Desat** alarm provides an additional limit setting below the low limit setting to notify of potentially life-threatening decreases in oxygen saturation. This additional limit is preset through Configuration mode.

NOTE: If the SpO₂ **Low Limit** alarm value is set below the configured SpO₂ **Desat Limit**, the Desat Limit is automatically adjusted to the SpO₂ **Low Limit** value. Should the SpO₂ reading fall below this value, the **Desat** physiological alarm is announced.

Changing SpO₂ and Pulse Alarm Limits

- ☉ To change the SpO₂ or Pulse high and low alarm limits:
 - 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight **Measurements/Alarms** and press the Smart Select knob.
 - 3 Select **SpO₂** or **Pulse** and press the Smart Select knob.
 - 4 Select **SpO₂ Limits** or **Pulse Limits** and press the Smart Select knob.
 - 5 Turn the Smart Select knob to select the new high limit value then press the Smart Select knob.
 - 6 Select the new low limit and press the Smart Select knob.

Figure 50 **Adjusting SpO₂ Alarms**



Enabling/Disabling SpO₂ and Pulse Alarms

- ☉ To enable/disable SpO₂ or Pulse alarms:
 - 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight **Measurements/Alarms** and press the Smart Select knob.
 - 3 Select **SpO₂** and press the Smart Select knob.
 - 4 Select **Alarms On (Alarms Off)** and press the Smart Select knob.

WARNING: Turning alarms off prevents all alarms associated with the SpO₂ measurement from being annunciated. If an alarm condition occurs, no alarm indication is announced.

Disabling SpO₂ Monitoring

- ⦿ To disable SpO₂ monitoring:
- 1 Disconnect the sensor cable from the SpO₂ port. The message **SpO2 Unplugged - Turn Off SpO2?** appears.
 - 2 Select **Yes** and press the Smart Select knob.

NOTE: If the sensor cable is disconnected accidentally, select **No** and press the Smart Select knob. Secure the sensor connection to begin SpO₂ monitoring again.

Caring for Sensors

Refer to the manufacturer's instructions for care and cleaning of sensors. To get the best results from reusable sensors, always handle the sensors and cable with care and protect them from sharp objects. The sensor houses a sensitive electronic device that can be damaged. Harsh treatment of the sensor reduces useful life.

Troubleshooting

If the HeartStart Intrepid does not operate as expected during SpO₂ monitoring, see [Table 121 "SpO2 Problems"](#) on page 240.

Monitoring Noninvasive Blood Pressure and Temperature

This chapter explains how to monitor noninvasive blood pressure (NBP) and temperature using the HeartStart Intrepid.

This chapter is divided into the following major sections:

	Overview	p. 109
	Safety Considerations for NBP	p. 110
	Measuring NBP	p. 111
	Monitoring Temperature	p. 115
	Caring for NBP Cuffs and Temperature Cables	p. 117
	Troubleshooting	p. 117

Overview

Noninvasive Blood Pressure (NBP) Monitoring

Noninvasive Blood Pressure (NBP) is measured with a NBP meter, also known as a blood pressure monitor, a sphygmomanometer, or blood pressure gauge. The meter uses an inflatable cuff to collapse the artery and then release it under the cuff. This measures the pressure at which blood flow is starting and at which pressure blood flow is unimpeded. The HeartStart Intrepid uses a mechanical manometer to measure at which pressure blood flow is starting, and at which pressure it is unimpeded.

The HeartStart Intrepid measures blood pressure for both adult and infant/child patients using the oscillometric method. Systolic, diastolic, and mean measurements are provided. Alarms are available to alert of changes in the patient's condition.

NBP measurements can be taken in Monitor, Manual Defibrillation, and Pacing modes. NBP and temperature are not available in AED mode. NBP measurements can be taken automatically on a pre-set schedule or manually on demand.

Temperature Monitoring

The HeartStart Intrepid offers one channel of real-time continuous temperature monitoring. The device can monitor nasopharyngeal, esophageal, rectal, skin, and urinary bladder temperatures. Measurements, which can be displayed in either Fahrenheit or Celsius degrees, may be taken while in Monitor, Pacer, or Manual Defibrillation modes.

Intended Use Populations

The noninvasive blood pressure (NBP) function and temperature function are intended for use on:

- Patients 25 kg (55 lb) or over or those 8 years old or over by using the Adult patient category.
- Patients less than 25 kg (55 lb) or under 8 years old by using the Infant/Child patient category.

Safety Considerations for NBP

WARNINGS: Do not perform noninvasive blood pressure measurements on patients with sickle-cell disease or any condition where skin damage has occurred or is expected.

Do not perform NBP monitoring on patients whose upper arm circumference is less than 13 cm. Doing so may result in inaccurate measurements.

Do not use in a hyperbaric chamber.

Care should be taken when using an oscillometric NBP device on patients with decreased consciousness, neuropathy, irregular cardiac rhythm, labile high blood pressure, increased arm activity, or arterial insufficiency especially if the unit is utilized for a prolonged period. A safeguard of the NBP system is that the device incorporates a **Stop NBP** soft key that can be pressed to deflate the cuff if the cuff is causing patient pain. Pay particular attention to unconscious patients since they cannot alert anyone if pain is present.

Use clinical judgment to decide whether or not to perform automatic blood pressure measurements on patients with severe blood clotting disorders because of the risk of hematoma in the limb wearing the cuff.

Do not apply the cuff to a limb that has an intravenous infusion or arterial catheter in place. This could injure the patient if the infusion is slowed or blocked during cuff inflation.

Use only approved cuffs and tubing in order to prevent inaccurate data, injury or damage. All specified cuffs are protected against the effects of the discharge of a defibrillator.

Prolonged series of NBP measurements in automatic mode may be associated with purpura, ischemia and neuropathy in the limb wearing the cuff. When monitoring a patient, examine the extremities of the limb frequently for normal color, warmth and sensitivity. If any abnormality is observed, stop the blood pressure measurements immediately.

Blood pressure readings may be affected by the position of the patient, their physiologic condition, the presence of arrhythmia and other factors.

Kinked or otherwise restricted tubing can lead to a continuous cuff pressure, causing blood flow interference and potentially resulting in injury to the patient.

Do not apply the cuff over a wound as this can cause further injury.

Avoid applying the cuff on the same side as a mastectomy as the pressure increases the risk of lymphedema or lymph node clearance. For patients with a bilateral mastectomy or lymph node clearance, use clinical judgement to decide whether the benefit of the measurement outweighs the risk.

To obtain accurate blood pressure readings, the cuff must be the correct size and also be correctly fitted to the patient. Incorrect size or incorrect fitting may result in incorrect readings.

CAUTIONS: Usage of a blood pressure cuff for noninvasive blood pressure (NBP) monitoring may cause minor skin irritation or bruising.

Do not compress or restrict pressure tubes during an NBP measurement.

The following factors can negatively affect NBP measurements or the ability to measure NBP:

- Difficulty in detecting a regular arterial pressure pulse.
- Excessive or continuous patient movement, such as shivering, convulsions, or movement during patient transportation.
- A patient who has cardiac arrhythmia, rapid blood pressure changes, severe shock or hypothermia, or is obese.
- Incorrect cuff size for the patient.

If liquid appears inside the tubing, contact a service personnel.

NOTE: When utilizing NBP, use clinical judgment on appropriate application for patient's clinical status.

Measuring NBP

Before measuring noninvasive blood pressure, review “[Safety Considerations for NBP](#)” on page 110.

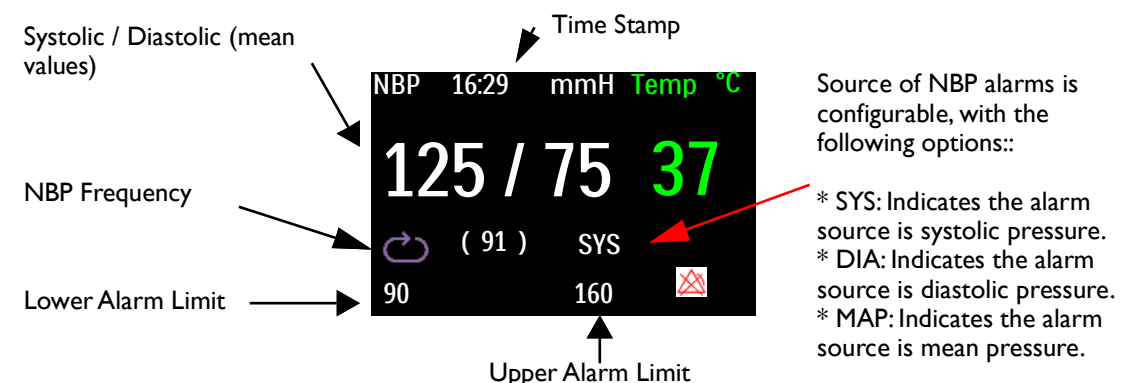
The cuff's initial inflation pressure and NBP overpressure safety limit are different based on the patient category:

- For an adult, the cuff's initial inflation pressure is 165 mmHg (22 kPa). The NBP overpressure limit is 300 mmHg (40.0 kPa).
- For an infant/child, the cuff's initial inflation pressure is 130 mmHg (17.3 kPa). The NBP overpressure limit is set to 150 mmHg (20.0 kPa).

If the cuff pressure exceeds the NBP overpressure safety limit, the device aborts the measurement, deflates the cuff, and generates the NBP Cuff Overpressure alarm. If you receive the NBP Cuff Overpressure alarm, measure the patient's blood pressure manually.

While an NBP measurement is in progress, the current cuff pressure is displayed in the Parameter area. Once the measurement is complete, the values for systolic, diastolic, and mean pressure are displayed along with the measurement schedule (manual or automatic intervals) and a time stamp.

Figure 51 NBP and Temperature Values Display



NOTE: For pediatric and adult patient populations, blood pressure measurements made with the HeartStart Intrepid are equivalent to those obtained by trained observers using the cuff/stethoscope auscultatory method within limits prescribed by IEC 80601-2-30/YY 0670-2008 (mean error difference of ± 5 mmHg or less, standard deviation of 8 mmHg or less).

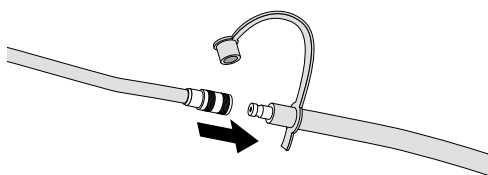
☉ To measure NBP:

- 1 Select the appropriately sized cuff for the patient. The cuff width should be either 40% of the limb circumference or 2/3 of the upper arm length. The inflatable part of the cuff should be long enough to encircle 50-80% of the limb.

NOTE: Pressurization of the cuff can temporarily cause loss of function of simultaneously used monitoring medical equipment on the same limb.

- 2 Attach the cuff to the NBP tubing, making sure that air can pass through the tubing and the tubing is not squeezed or kinked. Securely attach the cuff and tubing to prevent accidental disconnections.

Figure 52 **Connecting the NBP Cuff/Tubing**



- 3 Insert the NBP tubing into the NBP port as described in “Connecting the NBP Cable” on page 14.
- 4 Apply the blood pressure cuff to the patient’s arm as follows:
 - a Ensure that the cuff is completely deflated.
 - b Wrap the cuff around the arm, making sure that the artery marker is aligned over the brachial artery. Ensure that:
 - The cuff is not placed on the same extremity as an SpO₂ sensor.
 - The cuff is not wrapped too tightly around the limb. Excessive tightness may cause discoloration and eventual ischemia of the extremities.
 - The NBP tubing from the defibrillator to the cuff is not compressed, crimped or damaged.
 - The edge of the cuff falls within the range identified by the <—> markings.
- 5 Place the limb used for taking the measurement at the same level as the patient’s heart.
- 6 Press the [Start NBP] soft key. To stop an NBP measurement in progress, press the [Stop NBP] soft key.
- 7 When the measurement is complete, the NBP values are displayed. If you receive unexpected values, determine the patient’s vitals by other means and check that the equipment is working correctly.

Assessment of Hypertension

☉ To make a measurement for assessment of hypertension:

- 1 Ensure the patient is comfortably seated with their legs uncrossed and feet flat on the floor. Their back and arm should be supported.

- 2 Ask the patient to relax as much as possible and not talk during the measurement.
- 3 Confirm that the middle of the cuff is level with the right atrium of the heart.
- 4 If able, wait five minutes before making the first measurement.

NBP Frequency

NBP measurements can be taken on a manual or predetermined automatic basis, depending on how the device is configured and the patient's needs:

- **Manual.** One measurement is taken each time the **[Start NBP]** soft key is pressed. Take additional measurements by pressing the **[Start NBP]** soft key again.
- **Automatic.** A measurement is attempted at configured intervals (frequency) – every 1, 2.5, 5, 10, 15, 30, 60, or 120 minutes.

NOTE: All criteria must be met in order for an automatic NBP to be taken. For example, if the automatic measurement is set to every 1 minute, the device attempts to take an NBP every 60 seconds. However, for the measurement to successfully begin, the previous measurement must have ended, cuff must be deflated and 30 seconds must have elapsed after cuff deflation. If these criteria are not met, the device waits the 60 seconds to attempt another measurement.

Additional manual measurements can be taken without affecting the automatic measurement schedule by pressing the **[Start NBP]** soft key.

The configured NBP measurements schedule may be changed during an event.

◎ **To change the NBP schedule or the interval of automatic measurements for the current patient:**

- 1 Press the Smart Select knob.
- 2 Turn the Smart Select knob to highlight **Measurements/Alarms** and press the Smart Select knob.
- 3 Select **NBP** and press the Smart Select knob.
- 4 Select **NBP Frequency** and press the Smart Select knob.
- 5 Select the interval you want and press the Smart Select knob.

NOTES: Interval choices are indicated with qXX, where XX represents the time in minutes from the time the **[Start NBP]** soft key is pressed.

When cuff measurements are set to be taken at an automatic interval, there is a forced 30-second minimum period in between measurements, even if a measurement is due to be taken. The HeartStart Intrepid display shows the last NBP (if obtained in the last 60 minutes), time obtained, and frequency.

If no subsequent measurements are taken, NBP values are removed from the display after 60 minutes but can still be obtained through trends data and the event summary.

NBP Alarms

NBP alarms can be generated for the conditions shown in [Table 30 “NBP Physiological Alarms”](#) and [Table 31 “NBP Technical Alarms”](#). Once generated, they appear as alarm messages in the message area of the screen. If alarms are enabled, alarm limits appear next to the value. If alarms are off, the Alarms Off  symbol replaces the limits.

There are audio and visual alerts when a measurement for the configured source (systolic or diastolic mean) falls outside the configured high or low limits. NBP alarms are non-latching, meaning they are automatically removed when their alarm condition no longer exists. Both the source of the alarm and the limits may be changed during an ongoing patient event. For more information on alarms, see “Alarms” on page 37.

Alarms are on unless turned off during use. Once turned off, alarms remain off until they are turned back on.

WARNING: Turning alarms off prevents all alarms from being annunciated. If an alarm condition occurs, no alarm indication is announced.

Table 30 **NBP Physiological Alarms**

Alarm Message	Condition	Type of Alarm	Indicator
NBPs High NBPs Low	The NBP systolic value exceeds the high alarm limit or falls below the low alarm limit.	Medium priority latching configurable alarm	Yellow alarm message with audio tone
NBPd High NBPd Low	The NBP diastolic value exceeds the high alarm limit or falls below the low alarm limit.		
NBPM High NBPM Low	The NBP mean value exceeds the high alarm limit or falls below the low alarm limit.		

Table 31 **NBP Technical Alarms**

Alarm Message	Condition	Type of Alarm	Indicator
NBP Cuff Overpressure	The cuff pressure exceeds 300 mmHg (40 kPa).	Low priority non-latching alarm	Cyan alarm message with audio tone
NBP Cuff Not Deflated	The cuff fails to deflate.		
NBP Measurement Failed	The device is unable to complete a measurement because excessive pump-up time has been detected, the connecting tube is disconnected, or the determined blood pressure is outside the rated range for cuff pressure.		
NBP Calibration Overdue	NBP module calibration is due.		
NBP Equipment Malfunction	A problem with the NBP module has been detected.		
NBP Error	A non-critical failure has been detected.		

Changing NBP Alarm and Source Limits

- ⊙ To change the NBP alarm source and/or limits:
 - 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight **Measurements/Alarms** and press the Smart Select knob.
 - 3 Select **NBP** and press the Smart Select knob.

- 4 Select **NBP Limits** and press the Smart Select knob.
- 5 Select the source for the alarm (**Systolic**, **Diastolic**, or **Mean**) and press the Smart Select knob.
- 6 Turn the Smart Select knob to select the new high limit value then press the Smart Select knob.
- 7 Select the new low limit and press the Smart Select knob.

Enabling/Disabling NBP Alarms

NBP alarms are on unless specifically turned off or alarms for the entire device are off. Once disabled, alarms remain off until they are turned back on. You can configure alarm notifications.

- ☉ To enable/disable NBP alarms:
- 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight **Measurements/Alarms** and press the Smart Select knob.
 - 3 Select **NBP** and press the Smart Select knob.
 - 4 Select **Alarms On (Alarms Off)** and press the Smart Select knob.

NBP Calibration

NBP should be calibrated yearly. To calibrate the NBP module, call for service or refer to the *HeartStart Intrepid Service Manual*.

Monitoring Temperature

- ☉ To monitor temperature:
- 1 Connect the temperature cable to the HeartStart Intrepid.
 - 2 Check that the current device settings (including alarm settings) are appropriate for the patient.
 - 3 Connect the temperature probe to the cable.
 - 4 Apply the temperature probe to the patient.

Temperature Alarms

Alarms are annunciated when a measurement for the configured source falls outside the configured high or low limits. Temperature alarms are non-latching alarms, meaning they are automatically removed when their alarm condition no longer exists. Both the source of the alarm and the limits may be changed during an ongoing patient event. There are both audio and visual alerts. For more information on alarms, see “[Alarms](#)” on page 37.

Alarms are on unless turned off during use. Once turned off, alarms remain off until they are turned back on. If alarms are enabled, alarm limits appear next to the value. If alarms are off, the **Alarms Off**  symbol replaces the limits. You can configure alarm notifications.

WARNING: Turning alarms off prevents all alarms from being annunciated. If an alarm condition occurs, no alarm indication is announced.

Table 32 **Temperature Alarms**

Alarm Message	Condition	Type of Alarm	Indicator
Temp High	The temperature value exceeds the high alarm limit.	Medium priority latching configurable alarm	Yellow alarm message with audio tone
Temp Low	The temperature value has fallen below the low alarm limit.		
Temp out of range	Temperature out of range	Low priority	Cyan alarm message with audio tone
Temp Equipment Malfunction	Temperature Monitoring Malfunction	Low priority	
Temp Calibration Failed	Temperature Calibration Failure	Low priority	
Temp Unplugged	Temperature probe has become disconnected.	Low priority	
Temp Error	Temperature Source Malfunction	Low priority	

Changing Temperature Alarm Limits

- ⊙ To change the temperature alarm limits for the current incident:
 - 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight **Measurements/Alarms** and press the Smart Select knob.
 - 3 Select **Temp** and press the Smart Select knob.
 - 4 Select **Temp Limits** and press the Smart Select knob.
 - 5 Turn the Smart Select knob to change the high limit and press the Smart Select knob.
 - 6 Turn the Smart Select knob to change the low limit and press the Smart Select knob.

Enabling/Disabling Temperature Alarms

- ⊙ To disable temperature alarms (the alarms are on by default):
 - 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight **Measurements/Alarms** and press the Smart Select knob.
 - 3 Select **Temp**.
 - 4 Select **Alarms On** or **Alarms Off** and press the Smart Select knob.

Changing Units of Measurement

The HeartStart Intrepid can display temperature in either Fahrenheit or Celsius. The default is Celsius and can only be changed through Configuration mode.

Disabling the Temperature Function

To turn off the Temperature function, disconnect the temperature cable from the HeartStart Intrepid port. The message **Temp unplugged-Turn off Temp?** appears. Select **Yes** and press the Smart Select knob.

If the temperature cable get disconnected accidentally, or if the probe and cable separate, the message **Temp unplugged-Turn off Temp?** appears. To continue monitoring temperature, select **No** and press the Smart Select knob. Reconnect the temperature cable to restart the temperature monitoring function.

Caring for NBP Cuffs and Temperature Cables

Refer to the manufacturer's instructions for care and cleaning of the NBP cuffs temperature accessories and on disposal of temperature probes. To get the best results from your cuffs, handle them with care and protect them from sharp objects. Inappropriate treatment of the cuffs will reduce their lifetime.

Troubleshooting

If the HeartStart Intrepid does not operate as expected during NBP or temperature monitoring, see [Table 118 “NBP Problems”](#) on page 237 and [Table 123 “Temperature Monitoring Problems”](#) on page 242.

NOTES

[illegible]

12-Lead ECG

This chapter describes how to use the diagnostic 12-lead ECG function of the HeartStart Intrepid. This chapter is divided into the following major sections:

	Overview	p. 119
	12-Lead ECG Preview Screen	p. 120
	Patient Preparation for ECG	p. 122
	Acquiring a 12-Lead ECG	p. 122
	Improving Signal Quality	p. 123
	12-Lead ECG Report	p. 124
	Troubleshooting	p. 127

Overview

The optional 12-lead ECG function for both adult and infant/child patients is available in Monitor mode to preview, acquire, print, copy, and store a 12-lead ECG. The 12-lead ECG report provides measurements, interpretive statements, and critical value statements that help indicate whether the patient needs immediate attention.

Also, the 12-lead function can provide computerized ECG analysis based on its configuration options.

WARNING: Computerized ECG interpretation is not intended to be a substitute for interpretation by a qualified physician.

ECG Measurement Basis and the DXL Algorithm

The patient's age and sex must be provided for an accurate ECG; the DXL algorithm applies parameters based on the age and sex entered for the patient. Other patient information, such as the name, ID, and pacemaker (paced) status, is optional.

Patient age and sex are used to define normal limits for the following parameters:

- Heart rate
- Axis deviation
- Time intervals
- Voltage values
- Interpretation accuracy in tachycardia and bradycardia
- Prolongation or shortening of PR and QT intervals
- Hypertrophy
- Early repolarization

- Myocardial infarction
- Culprit artery detection

DXL Algorithm and Configuration

The Philips DXL 12-lead Algorithm provides an analysis of the amplitudes, durations, and morphologies of the ECG waveforms and the associated rhythm.

The DXL Algorithm also identifies internally paced patients automatically:

- For more information on the algorithm's function, including theoretical and practical aspects of ST Elevation Myocardial Infarction (STEMI) detection, see the *Philips DXL ECG Algorithm* application note.
- For more information about 12-lead and DXL algorithm configuration, see [Table 66 "Configuration – 12-Lead"](#) on page 173.

The DXL Algorithm is capable of interpreting up to 16 leads, however the HeartStart Intrepid uses the 12-lead function.

WARNING: Before changing the configuration, carefully consider clinical implications of this algorithm configuration choice. Selecting EMS results in a slight decrease in sensitivity compared to the AMI detection sensitivity reported in the latest edition of the *Philips' DXL 12-Lead Algorithm Application Note*.

12-Lead Filters

12-lead ECG waveforms shown on the HeartStart Intrepid may be configured with ECG bandwidth filters of 0.15 - 40 Hz, 0.05 - 40 Hz, or 0.05 - 150 Hz. Additionally, the 12-lead report may be configured to apply either the same filter choice used for the display, or a 0.05 - 150 Hz filter. The filter setting for the 12-lead report is applied to both printed and stored 12-lead reports.

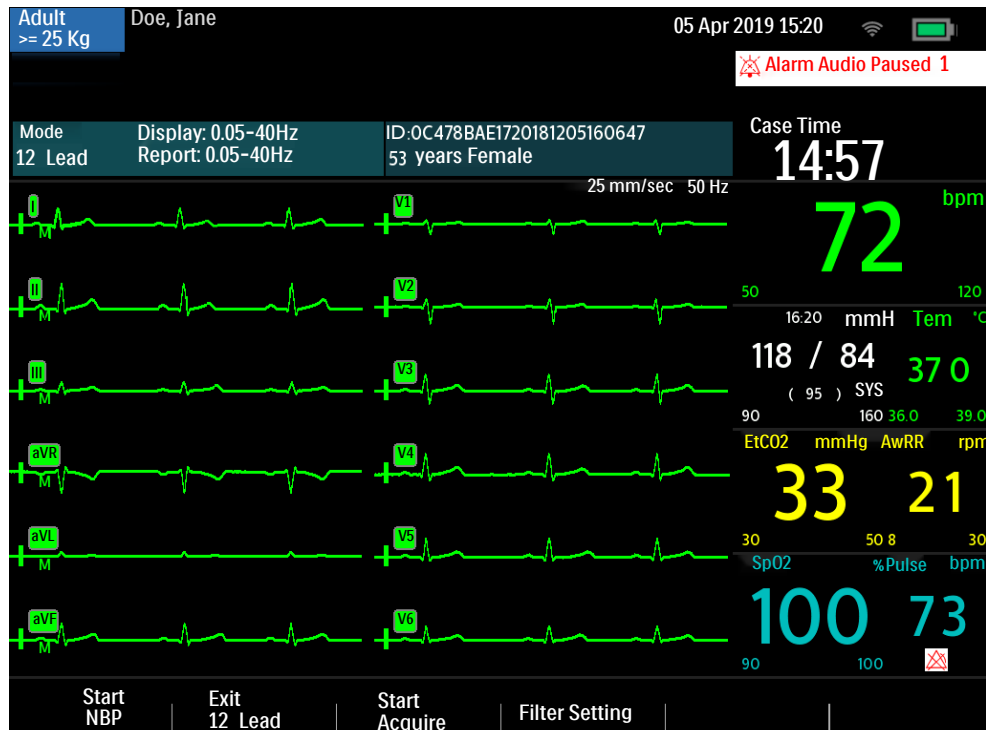
Regardless of filter settings for display or printing, the HeartStart Intrepid uses the full 0.05 -150 Hz bandwidth for its analysis. The full bandwidth is also transmitted.

A filter soft key is available to switch between filter settings during use. When changing the filter during use, the filter setting is applied to both the display and the 12-lead report. The display and 12-lead report filter settings are returned to their configured settings when the Therapy knob is moved from the Monitor position.

12-Lead ECG Preview Screen

The 12-lead ECG preview screen displays real-time 12-lead ECG data and verify signal quality before acquiring the ECG. As shown in [Figure 53](#), it displays patient information and approximately 2.5 seconds of each of the 12 leads acquired. Waveforms are presented at a rate of 25 mm/sec and the configured wave size. A dashed line is displayed if a lead cannot be derived. The **Leads Off** message is displayed if an electrode is not making adequate contact with the patient.

Figure 53 12-Lead ECG Preview Screen



The patient information includes ID, age, and sex if entered. The Event ID is displayed until the patient's ID is entered.

The 12-lead ECG preview presents information as shown in Table 33. Press the **Lead Select** button to navigate through the preview sets.

Table 33 12-Lead ECG Preview Sets

Wave Set	Waves displayed in sector	
	1	2
1	I	V1
2	II	V2
3	III	V3
4	aVR	V4
5	aVL	V5
6	aVF	V6

Although waveforms for monitored parameters such as ECG, SpO₂, and CO₂ are not visible on the preview screen, related alarms, measurements, and technical alarms remain active and are reported in the Parameter and Status areas.

NOTE: ECG sample rate: 1000 samples/sec. Channel skew: ≤100 μs. Amplitude resolution: 2.12 μV/LSB.

Patient Preparation for ECG

Proper skin preparation and electrode placement are the most important aspects for a high quality 12-lead ECG. The patient should be supine and relaxed when an ECG is acquired. See *Improving ECG Quality* Application Note.

◎ To prepare for acquiring the ECG:

- 1 Connect the 10-lead cable to the Therapy Port.
- 2 Prepare the skin and apply electrodes, as described in “[ECG Electrode Placement](#)” on page 51.
- 3 Turn the Therapy knob to Monitor.
- 4 Press the [12-Lead] soft key.

Acquiring a 12-Lead ECG

The patient’s age and sex must be entered for the device to provide an ECG interpretation:

- For a partial ECG interpretation, a minimum of one chest lead and all limb leads are required.
- For a full ECG interpretation, all six chest leads and all limb leads are required.

The time to acquire a 12-lead ECG may vary. For example, wet gel electrodes take less time to settle than hydrogel electrodes. Pressing the [Start Acquire] soft key before the 12-lead ECG can be acquired may result in a dashed line.

The Lead Select button is disabled when the 12-lead function is active.

When the 12-lead acquisition is complete, one or two copies of the 12-lead report are printed, depending on your device configuration. The printed report also includes a rhythm strip with up to three ECG leads.

WARNING: An incorrect patient age or sex can result in misdiagnosis.

NOTE: High impedance may prevent some 12-lead waveforms from being displayed, even when all ECG monitoring electrodes are properly placed with good contact and adhesion on the patient.

◎ To acquire a 12-lead ECG in Monitor mode:

- 1 Perform preparation steps as described in “[Patient Preparation for ECG](#)” on page 122.
- 2 Press the [12-Lead] soft key. The Preview Screen is displayed, as shown in [Figure 53](#) on page 121.
- 3 Check the signal quality on each lead. If necessary, make adjustments as described in “[Improving Signal Quality](#)” on page 123.
- 4 Check filter settings.
- 5 Press the [Start Acquire] soft key. If patient age and sex were not previously entered, prompts appear to enter the information.
- 6 Use the Smart Select knob to select and adjust the patient’s sex and age. The message **Acquiring 12-Lead** is then displayed while the HeartStart Intrepid acquires ten seconds of ECG data.

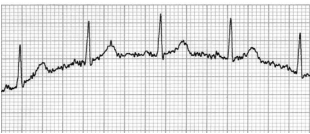
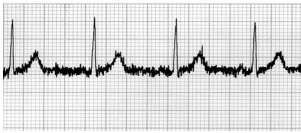
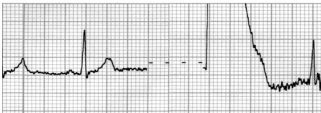
- 7 Keep the patient still while the message **Acquiring 12-Lead** is displayed:
 - Once ECG acquisition is complete, ECG analysis begins automatically and is accompanied by the message **Analyzing 12-Lead**. The patient does not need to be still during this time.
 - Following analysis, the 12-lead report is displayed, printed, and stored internally.
- 8 If necessary, do one of the following:
 - To acquire another 12-lead ECG, press the **[New 12-Lead]** soft key. If you press the **[New 12-Lead]** soft key while a report is printing, the device finishes printing the current report before acquiring the new 12-lead ECG (or you can cancel printing the current report).
 - To print the 12-lead ECG report, press the **[Print]** soft key to print another copy.
 - To send the 12-lead ECG report, press the **[Send]** soft key to send the 12-lead ECG report. For more information, see “[Network Connection and Sending Data](#)” on page 186.
 - To exit the 12-lead function, press the **[Exit 12-Lead]** soft key.

WARNING: Do not pull on the paper while a report is being printed. This can cause distortion of the waveform and lead to potential mis-diagnosis.

Improving Signal Quality

Signal quality can impact ECG analysis. See *Improving ECG Quality* Application Note or refer to [Table 34](#) for possible solutions to common ECG quality problems.

Table 34 **ECG Signal Problems**

Problem	Possible Causes	Possible Solutions
Tremor or muscle artifact 	• Poor electrode placement. • A cold patient. • Tense, uncomfortable patient. • Patient tremors.	• Clean the site and reapply electrodes. Be sure the electrodes are placed on flat, non-muscular areas of the body. • Warm the patient. • Reassure and relax the patient. • Attach electrodes high on the extremities, near the trunk.
Baseline wander 	• Patient movement. • Electrode movement. Poor electrode contact and skin preparation. • Respiratory interference.	• Reassure and relax the patient. • Be sure lead wires are not pulling on the electrodes. • Move electrodes away from areas with the greatest respiratory motion, if possible.
Power line AC Interference 	• Poor electrode contact. Dry or dirty electrodes. • Interference from poorly grounded instrument near patient.	• Apply new electrodes. • Route electrode wires along the limbs and away from other electrical equipment.
Intermittent or jittery waveform 	• Poor electrode contact. • Dry electrodes. • Faulty lead wires	• Clean the site and reapply electrodes. • Apply new electrodes. • Repair or replace faulty leads.

12-Lead ECG Report

The 12-lead report view is similar to Monitor View to enable patient monitoring while viewing the report. The 12-lead report view replaces wave sectors 3 and 4 in Monitoring View, as shown in [Figure 54](#).

The 12-lead ECG report may contain the data listed in [Table 35](#). Some data must be configured for it to appear. Note the following differences between the 12-lead report shown on the device versus the printed 12-lead ECG report:

- Full interpretive statements appear on the printed strip but may be shortened on the display.
- If an alarm condition occurs while a 12-lead ECG report is printing, the alarm strip is not printed, but the corresponding ECG waveform is stored and available in the event summary.
- The printed 12-lead report header contains the acute MI detection configuration (**Standard** or **EMS**).
- Stored 12-lead reports can be configured to include all 12 leads, measurements, and interpretive analysis statements.

Table 35 12-Lead ECG Report Data

Data	Descriptions
Measurements	Measurement data includes standard interval and duration measurements in milliseconds, limb lead axis measurements in degrees, and heart rate in beats per minute.
Interpretive statements	Interpretive statements describe the patient's cardiac rhythm and waveform morphology. Culprit artery detection may also locate the probable anatomical site of a coronary artery occlusion responsible for ischemia. Statements regarding signal quality problems encountered during ECG acquisition are also included in this section.
Critical value statements	Critical value statements aid in quickly identifying an interpretation that may require immediate patient attention. Statements identify any of four life-threatening conditions: acute myocardial infarction, acute ischemia, complete heart block, and extreme tachycardia. The values appear as white text on a red background.
ECG severity	Each interpretive statement on the report has an associated severity. The severities of all selected interpretive statements are assessed to determine an overall severity for the ECG. The categories of severity are: normal ECG, otherwise normal ECG, borderline normal ECG, abnormal ECG, and defective ECG.

Figure 54 Device Display of 12-Lead ECG Information

Measurements	Interpretive Statements	ECG Severity	Critical Value Statement
HR 60 PR 168 QSRD 74	Sinus rhythm Consider right atrial abnormality Inferior injury, probably early acute infarct Lateral leads are also involved	-ABNORMAL ECG	Unconfirmed diagnosis
QT 360 QTc 360 ----A----- P 52 QRS 45 T 41			
			>>> Acute MI <<<
Start NBP	Exit 12-Lead	New 12-Lead	Print
			Send

Interpretive and Critical Value Statements

Certain interpretive results generate critical value statements which alert you to a condition which may need immediate attention. The critical value statements appear on the bottom of the HeartStart Intrepid 12-lead display in white text on a red background with directional arrows (>>> <<<) on each side of the statement text.

Acute Myocardial Infarct

If an interpretive statement listed in [Table 36](#) results from measurements generated by an ECG, the critical value statement **Acute MI** appears on the 12-lead report.

Table 36 Acute MI Statements

Interpretive Statement	Criteria
Probable anterolateral infarct, acute	ST > 0.15 mV, V2-V6, aVL
Anterolateral infarct, possibly acute	Q > 35 mS, ST > 0.15 mV, V2-V6, I, aVL
Anterolateral infarct, acute	ST > 0.20 mV, V2-V6, I, aVL
Anterolateral infarct, acute (LAD)	ST > 0.20 mV, V2-V6, I, aVL
Probable anteroseptal infarct, acute	ST > 0.15 mV, T UPRIGHT, V1-V2
Anteroseptal infarct, possibly acute	Q > 35 mS, ST > 0.15mV, V1-V2
Anteroseptal infarct, acute	ST > 0.20 mV, V1-V2
Anteroseptal infarct, acute (LAD)	ST > 0.25 mV, V1-V2
Probable anterior infarct, acute	ST > 0.15 mV, UPRIGHT T, V2-V5
Anterior infarct, acute	ST > 0.25 mV, V2-V5
Anterior infarct, acute (LAD)	ST > 0.25 mV, V2-V5
Anterior infarct, possibly acute	ST > 0.15 mV, UPRIGHT T, V2-V5
Extensive anterior infarct, acute	ST > 0.20 mV, V1-V6
Extensive anterior infarct, acute (LAD)	ST > 0.20 mV, V1-V6

Table 36 **Acute MI Statements (Continued)**

Interpretive Statement	Criteria
Extensive anterior infarct, possibly acute	Q > 35 mS, ST > 0.15 mV, V1-V6
Probable inferior infarct, acute	ST > 0.10 mV, II III aVF
Inferior infarct, possibly acute	Q > 30 mS, ST > 0.10 mV, II III aVF
Inferior infarct, acute	ST > 0.10 mV T UPRIGHT, II III aVF
Inferior infarct, acute (RCA)	ST > 0.10 mV IN III > II
Inferior infarct, acute (LCX)	ST > 0.10 mV II III aVF, STD V1-V3
Inferoposterior infarct, acute	ST > .1 INF, <-.1 V1-3 OR >.05 V7-9
Inferoposterior infarct, acute (RCA)	ST > .1 INF, <-.1 ANT
Inferoposterior infarct, acute (LCX)	ST > .1 INF, <-.1 V1-3 OR >.05 V7-9
Inferolateral infarct, acute	ST > .10 mV, INF-LAT LEADS
Inferolateral infarct, acute (LCX)	ST > .10 mV, INF-LAT LEADS
Inferolateral infarct, acute (RCA)	ST > .10 mV, INF-LAT LEADS
Probable lateral infarct, acute	Q > 28 mS, ST > 0.10 mV, V5 V6 I aVL
Lateral infarct, possibly acute	Q > 28 mS, ST > 0.10 mV, V5 V6 I aVL
Lateral infarct, acute	ST > .10 mV, V5 V6 I aVL
Lateral infarct, acute (LAD)	ST > .10 mV, V5 V6 I aVL
Posterior infarct, acute	ST <-.01 V1-V3 or ST > .05 V7-V9
Probable posterior infarct, acute	ST <-.05 V1-V3 or > .05 V7-V9
Posterior infarct, acute (LCX)	ST <-.01 V1-V3 or ST > .05 V7-V9

Acute Ischemia

If the interpretive statement listed in [Table 37](#) results from measurements generated by an ECG, the critical value statement **Acute Ischemia** appears on the 12-lead report.

Table 37 **Acute Ischemia Statements**

Interpretive Statement	Criteria
Repol abnrm, severe global ischemia (LM/MVD)	STe aVR, STd & Tneg, ant/lat/inf

Extreme Tachycardia

If an interpretive statement listed in [Table 38](#) results from measurements generated by an ECG, the critical value statement **Very High Heart Rate** appears on the 12-lead report.

Table 38 **Extreme Tachycardia Statements**

Interpretive Statements
Extreme tachycardia v-rate > (220-age)
Wide-QRS tachycardia v-rate > ***, QRSD > ***
Extreme tachycardia with wide complex, no further rhythm analysis attempted

Complete Heart Block

If an interpretive statement listed in [Table 39](#) results from measurements generated by an ECG, the critical value statement **Complete Heart Block** appears on the 12-lead report.

Table 39 **Complete Heart Block Statements**

Interpretive Statements
AV block, complete (third degree) v-rate < ***, AV dissociation
Complete AV block with wide QRS complex v-rate < ***, QRSD > ***, AV dissoc
Atrial flutter/fibrillation with complete AV block

Accessing Stored Reports

Access stored reports to print additional copies from internal storage. You can also copy the report to a USB drive or transmit wirelessly. The list of stored reports for the current patient event may be accessed while a report is displayed or from either the 12-lead acquire screen or the 12-lead preview screen.

- ☉ To access a stored report:
 - 1 While in 12-lead, press the Smart Select knob.
 - 2 Rotate the Smart Select knob to select **Reports**.
Reports for the current patient event are listed by date, time, and sequence number.
 - 3 Use the Navigation buttons to select a report and press the Smart Select knob.
 - 4 Select **Print** or **Send** and press the Smart Select knob.
 - 5 To select another report, repeat [Step 1](#) through [Step 3](#).
 - 6 Press **Exit** to close the menu.

Troubleshooting

If the HeartStart Intrepid does not operate as expected during 12-lead ECG operation, see [Chapter 19 “Troubleshooting”](#) on page 227.

NOTES

[illegible]

Monitoring Carbon Dioxide

This chapter describes how to monitor carbon dioxide (CO₂) and measure end-tidal carbon dioxide (EtCO₂) and Airway Respiration Rate (AwRR).

This chapter is divided into the following major sections:

 Overview	p. 129
 Safety Considerations for Measuring EtCO ₂	p. 130
 Preparing to Measure EtCO ₂	p. 131
 Monitoring EtCO ₂	p. 133
 EtCO ₂ and AwRR Alarms	p. 134
 Zeroing the CO ₂ Module	p. 136
 EtCO ₂ Accuracy	p. 138
 Disabling the EtCO ₂ Monitoring Function	p. 139
 Troubleshooting	p. 139

Overview

The carbon dioxide monitoring function of the HeartStart Intrepid measures the partial pressure of carbon dioxide in a sample of the patient's exhaled breath. The HeartStart Intrepid can be used to monitor carbon dioxide in both intubated and non-intubated patients.

The partial pressure of carbon dioxide is derived by multiplying the measured carbon dioxide concentration with the ambient pressure. From the partial pressure measurement, the end-tidal carbon dioxide (EtCO₂) is derived.

EtCO₂ is the peak CO₂ value measured during expiration. It is used to monitor the patient's respiratory status. The EtCO₂ measurement uses a technique based on the absorption of infrared radiation by carbon dioxide. It indicates the change in the elimination of CO₂. The EtCO₂ measurement rate is 100 samples per second.

The CO₂ monitoring function of the HeartStart Intrepid provides an EtCO₂ value, a CO₂ waveform (Capnograph), and an airway respiratory rate (AwRR). The AwRR relies on CO₂ functionality to identify valid breaths for numeric display and alarm conditions such as no breath detected. AwRR measurement is based on the average of the last eight detected breaths.

CO₂ monitoring is available in AED, Monitor, Pacer, and Manual Defib modes.

Intended Use Population

The end-tidal CO₂ (EtCO₂) function is intended for use on:

- Patients 25 kg (55 lb) or over or those 8 years old or over by using the Adult patient category.
- Patients less than 25 kg (55 lb) or under 8 years old by using the Infant/Child patient category.

Safety Considerations for Measuring EtCO₂

WARNINGS: The Sampling line may ignite in the presence of oxygen when directly exposed to laser, ESU devices or high heat. When performing head and neck procedures involving laser, electrosurgical devices, or high heat, be careful to prevent igniting the sampling line or surrounding environment.

The EtCO₂ readings do not always correlate exactly with blood gas values, especially in patients with pulmonary disease, a pulmonary embolism, or inappropriate ventilation.

EtCO₂ and AwRR measurements may be inaccurate when the CO₂ sensor needs to be zeroed or has not had sufficient time to warm up. Sensor application errors and environmental conditions may also affect measurements.

Check for physical occlusions such as a kink in the sample line or the patient lying on the sample line before measuring EtCO₂.

Do not use on patients that cannot tolerate the withdrawal of 50 ml/minute $\pm$ 10 ml/minute from the airway or patients that cannot tolerate the added dead space to the airway.

CO₂ measurements may be inaccurate when measured in the presence of aerosolized pharmaceuticals or anesthetic gases. EtCO₂ accuracy has a maximum error in CO₂ concentration of 5% and 10% using an I:E ratio of 1:2.

The CO₂ sensor port should vent into open air. Do not block the exhaust port on the sensor. If the port is blocked, there could be a significant delay in measurement readings with no indication of a problem.

When using a nasal sample line, if one or both nostrils are partially or completely blocked, or the patient is breathing through the mouth, the displayed EtCO₂ values may be significantly low.

When measuring EtCO₂ on patients who are receiving or have recently received anesthetics, connect exhaust tubing from the CO₂ Outlet port to a scavenging system or to the anesthesia machine/ventilator to prevent exposing medical staff to anesthetics. Use an exhaust tube attached to the CO₂ outlet port to remove the sample gas to a scavenging system.

To avoid risk of patient cross-infection, do not connect the exhaust to the patient circuit.

Nitrous oxide, elevated levels of oxygen, helium, and halogenated hydrocarbons can influence the CO₂ measurement.

Carefully route the sampling line to reduce the possibility of patient entanglement or strangulation.

Reflux of gastric contents, mucus, pulmonary edema fluid or endotracheal epinephrine introduced into the detector can increase airway resistance and affect ventilation. Discard accessory if this occurs.

The presence of carbonated beverage or antacids in the stomach may cause incorrect readings and unreliable capnography in identifying esophageal intubation.

CAUTIONS: Calibration gases must be disposed of in accordance with local regulations.

Any fluids accumulated in the patient accessory or water filter assembly should be treated as a hazard when full of fluid.

NOTES: Automatic correction on the CO₂ values is performed using internal barometric pressure and sample cell pressure measurements. CO₂ values are normalized to barometric pressure.

The water filter assembly lasts up to the following lengths of time:

- 12 hours when used without the dehumidification tubing in a non-humidified environment.
- 120 hours when used with the dehumidification tubing under conditions based on a sample gas temperature of 37°C, a room temperature of 23°C, and sample relative humidity (non-condensing) of 100%, as defined in ISO 80601-2-55/YY 0601-2009.

To set the EtCO₂ module atmospheric pressure, perform the cell pressure accuracy check. For more information, see the *HeartStart Intrepid Service Manual*.

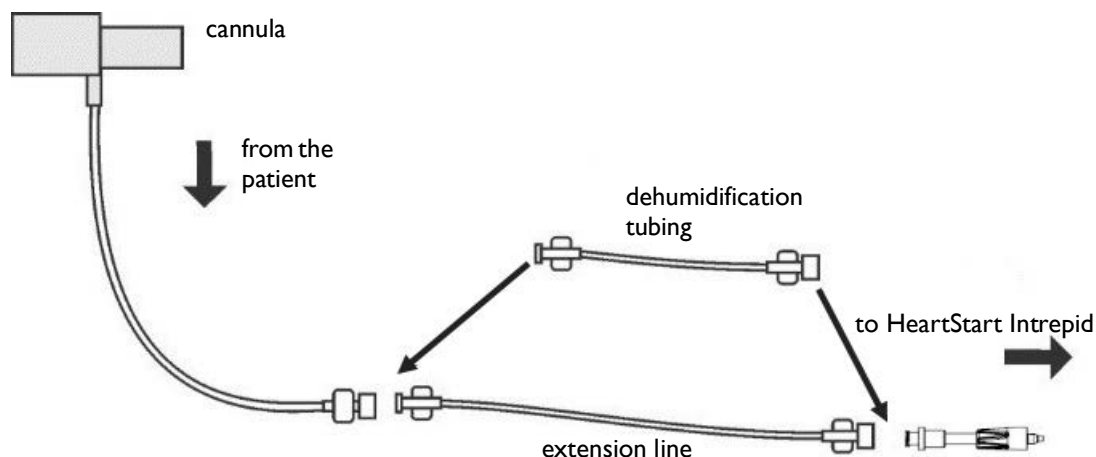
EtCO₂ and respiration rate accuracy is verified by using a solenoid test setup to deliver a square wave of known CO₂ concentration to the device. 5% and 10% CO₂ concentrations were used and respiration rate was varied over the range of the device. Pass/fail criteria was a comparison of the respiratory rate output from the sensor to the frequency of the square wave. EtCO₂ measurements at those rates were compared to the CO₂ readings under static flow conditions. The respiration rate range is 0.2 to 100 br/m ± 1br/m, 8-breath averaging. The EtCO₂ is calculated by the peak of the expired CO₂ waveform over the selected time period. A minimum of 5 mmHg between peak and valley of waveform is required.

Preparing to Measure EtCO₂

The EtCO₂ airway assembly is configurable to meet a patient's needs and your organization's guidelines. For an example of the assembly, see [Figure 55](#).

Do not connect more than one extension line. One extension line and one dehumidification tube provide the longest sampling line. To maintain the dehumidifying function, replace the dehumidification tube as directed by the manufacturer's instructions.

Figure 55 CO₂ Airway Assembly



Selecting the Accessories

Consider the following aspects when selecting accessories used for EtCO₂ monitoring:

- The type of patient: adult or infant/child.
- Airway status of the patient: ventilated or not ventilated.
- For a ventilated patient: humidified or non-humidified ventilation.

WARNINGS: Use only supplies and accessories approved for use with the HeartStart Intrepid.

Do not position patient accessories in any manner that may cause entanglement or strangulation.

Do not re-use, clean, or sterilize single-use CO₂ accessories as they are intended for single-patient, one-time use. Reuse may cause a risk of contamination and affect measurement accuracy. Clean reusable accessories according to the manufacturer's recommendations.

Using the Cannula

For patients prone to mouth breathing, use an oral-nasal cannula.

☉ To set up EtCO₂ measurements using the nasal or oral cannula:

- 1 Attach the cannula tubing to the CO₂ Inlet port as described in [“Connecting the CO₂ Filter Line”](#) on page 13.
- 2 If using a nasal cannula, check that both nostrils are clear.
- 3 Position the cannula on the face by inserting the tips into the nostrils or mouth.
- 4 Pass the tubing over the ears, then slide the sleeve up the tubing towards the neck to a comfortable fit under the chin. If using dual purpose tubing, connect the green tubing to the oxygen source. Check the positioning of the tubes regularly to ensure proper monitoring function.
- 5 If a CO₂ Check Line technical alarm appears, check the cannula tubing and the water filter assembly. Replace one or both components if they appear occluded.

Using the Cannula with Airway Adapter

☉ To set up EtCO₂ measurements using the cannula and airway adapter:

- 1 Attach the tubing to the CO₂ Inlet port as described in [“Connecting the CO₂ Filter Line”](#) on page 13.
- 2 Connect the inlet of the airway adapter to the endotracheal tube and connect the narrow end of the airway adapter to the ventilator tubing or manual resuscitator.
- 3 Support the airway adapter to prevent stress on the tube.
- 4 If the CO₂ Check Line technical alarm appears, check the cannula tubing and the water filter assembly. Replace one or both components if they appear contaminated.
- 5 Disconnect the adapter during suctioning and nebulizing therapies. For best results for non-humidified use, change the adapter after 24 hours of continuous use.

Monitoring EtCO₂

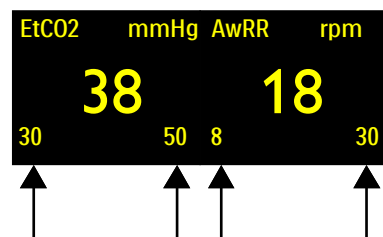
☉ To monitor EtCO₂:

- 1 Connect the sampling line to the HeartStart Intrepid.
- 2 Apply the sampling line to the patient.
- 3 If the HeartStart Intrepid is not turned on, turn the Therapy knob to a clinical mode.
EtCO₂ needs to be configured to appear in AED mode.
- 4 Check that the patient category is appropriate for the patient.
If necessary, press the Patient Category button to change the patient category. (See “[General Function Buttons](#)” on page 28.)

The EtCO₂ measurement automatically turns on when a sensor is connected to the CO₂ port. The Capnogram is displayed in the configured wave sector if available. The measurement values for EtCO₂ and AwRR are displayed:

- If there is a **-?-** in the parameter block and a dashed line in place of the Capnogram on the display, the waveform source is invalid. Check patient, confirm airway status, and examine the cable and sensor for a good connection. Also check the sampling line to make sure it is connected to the sensor and not kinked or pinched.
- If there is a **?** before the measurement and a Capnogram on the display, the sensor is warming up. As soon as the sensor is warmed up, the **?** is removed from the display.
- If the CO₂ waveform appears as a flat line, a blockage may have occurred during monitoring. If alarms are on, an apnea alarm is generated.

Figure 56 **EtCO₂ and AwRR**



Alarm Limits: If alarms are turned on, the alarm limits are displayed. If alarm limits are turned off, the Alarms Off symbol  is displayed.

WARNING: Leakages in the breathing or sampling system may cause the displayed EtCO₂ values to be significantly low. Always connect all components securely and check for leaks according to standard clinical procedures. Displacement of the nasal or combined nasal oral cannulas can cause lower than actual EtCO₂ readings. Even with combined nasal and oral cannulas, the EtCO₂ readings may be slightly lower than actual in patients breathing through the mouth only.

Inspiratory/Expiratory (I:E) ratios <2:1 have no effect on stated EtCO₂ levels. For I:E ratios >2:1, the EtCO₂ accuracy specification is as follows:

IE2:1	-7% + -4% for every 10BPM over 40
IE3:1	-7% + -5% for every 10BPM over 30
IE4:1	-12% + -6% for every 10BPM over 30

EtCO₂ and AwRR Alarms

All EtCO₂ alarms except Apnea are categorized as non-latching alarms, meaning they are automatically removed when their alarm condition no longer exists. Apnea alarms are latching, meaning they remain present even if the alarm condition no longer exists. EtCO₂ and AwRR alarms are on (except in AED mode) by default.

For a list of EtCO₂ alarms and their conditions, see [Table 40](#) and [Table 41](#). For general information about alarms, see “[Alarms](#)” on page 37.

WARNING: If EtCO₂ and AwRR alarms are turned off or alarms for the entire device are turned off, the EtCO₂ and AwRR alarms remain off until they are turned back on.

Table 40 EtCO₂ Physiological Alarms

Message	Condition	Type of Alarm	Indication
Apnea	No detectable breaths for the configured number of seconds.	High priority, latching alarm	Red alarm message with audio tone
EtCO ₂ High	The EtCO ₂ value exceeds the high alarm limit.	Medium priority, latching configurable alarm	Yellow alarm message with audio tone
EtCO ₂ Low	The EtCO ₂ value has fallen below the low alarm limit.		
AwRR High	The AwRR value exceeds the high alarm limit.		
AwRR Low	The AwRR value has fallen below the low alarm limit.		

Table 41 EtCO₂ Technical Alarms

Message	Condition	Type of Alarm	Indication
CO ₂ Sensor Over Temp	CO ₂ sensor is reporting an over temperature condition.	High Priority Non-Latching Alarm	Red alarm message with audio tone.
CO ₂ Service Required	CO ₂ sensor requires service.		
CO ₂ Communication Failure	CO ₂ sensor is connected but the HeartStart Intrepid cannot communicate with it.		

Table 41 **EtCO₂ Technical Alarms**

Message	Condition	Type of Alarm	Indication
CO ₂ Zero Required	CO ₂ sensor needs to be zeroed.	Low Priority Non-Latching Alarm	Cyan alarm message with audio tone.
CO ₂ Sensor Warming Up	CO ₂ sensor has not warmed up to operating temperature range.		
CO ₂ Check Line	The sampling line is kinked or blocked.		
CO ₂ Error	A non-critical failure has been detected.		
CO ₂ Out of Range	CO ₂ is out of range.		
CO ₂ Tube Unplugged	Sampling line is disconnected.		
CO ₂ Power Overload	CO ₂ sensor has a power problem.		

Changing the EtCO₂ Alarm Limits

- ⦿ To change the EtCO₂ alarm limits:
 - 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight the **Measurements/Alarms** menu and press the Smart Select knob.
 - 3 Select **EtCO₂** and press the Smart Select knob.
 - 4 Select **EtCO₂ Limits** and press the Smart Select knob.
 - 5 Turn the Smart Select knob to select the new high limit value then press the Smart Select knob.
 - 6 Set the new low limit value and press the Smart Select knob.

Enabling/Disabling the EtCO₂ Alarms

- ⦿ To enable or disable the EtCO₂ alarms:
 - 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight the **Measurements/Alarms** menu and press the Smart Select knob.
 - 3 Select **EtCO₂** and press the Smart Select knob.
 - 4 Select **Alarms On (Alarms Off)** and press the Smart Select knob.

Changing the AwRR Alarm Limits

- ⦿ To change the AwRR alarm limits:
 - 1 Press the Smart Select knob.
 - 2 Turn the Smart Select knob to highlight the **Measurements/Alarms** menu and press the Smart Select knob.
 - 3 Select **AwRR** and press the Smart Select knob.
 - 4 Select **AwRR Limits** and press the Smart Select knob.

- 5 Turn the Smart Select knob to select the new high limit value then press the Smart Select knob.
- 6 Set the new low limit value and press the Smart Select knob.

Changing the Apnea Time Alarm Limit

Apnea measurement is based on the configured apnea time.

WARNING: The safety and effectiveness of the respiration measurement method in the detection of apnea, particularly the apnea of infancy, has not been established.

☉ To change the apnea time alarm limit:

- 1 Press the Smart Select knob.
- 2 Turn the Smart Select knob to highlight the **Measurements/Alarms** menu and press the Smart Select knob.
- 3 Select **AwRR** and press the Smart Select knob.
- 4 Select **Apnea Time** and press the Smart Select knob.
- 5 Turn the Smart Select knob to select the new value then press the Smart Select knob.

Enabling/Disabling AwRR Alarms

- 1 Press the Smart Select knob.
- 2 Turn the Smart Select knob to highlight the **Measurements/Alarms** menu and press the Smart Select knob.
- 3 Select **AwRR** and press the Smart Select knob.
- 4 Select **Alarms On (Alarms Off)** and press the Smart Select knob.

Zeroing the CO₂ Module

To help prevent inaccurate readings, reset (zero) the CO₂ module upon the following conditions:

- A new sample line has been connected.
- The accuracy of the EtCO₂ reading is questionable.
- A HeartStart Intrepid message indicates that zeroing is needed.
- A significant change in environmental conditions has occurred.

For best results, allow the CO₂ module to warm up for three minutes or when “CO₂ Sensor warming up message” is no longer displayed before zeroing the CO₂ module

NOTES: Do not zero the CO₂ module without a sampling line installed.

Wait 20 seconds after removing the sampling line from the patient's airway before zeroing the CO₂ module, so any lingering CO₂ in the line can dissipate.

Keep the sampling line away from all sources of CO₂, including exhaled breaths and ventilator exhaust.

During zeroing, EtCO₂ data is invalid. A **-?-** is displayed in the parameter block and a dashed line appears in the wave sector.

Zeroing Using the Soft Key

The **[Zero CO₂]** soft key does not appear while the Trends table is displayed.

☉ To zero the CO₂ module using the soft key:

- 1 Confirm the HeartStart Intrepid is in a clinical mode.
- 2 Confirm that the sampling line has been removed from the patient.
- 3 Press the **[Zero CO₂]** soft key:
 - The **[Zero CO₂]** soft key is grayed out when the HeartStart Intrepid is in the process of zeroing the sensor.
 - The **CO₂ Zero in Progress** message appears on the display. The message disappears when zeroing is finished.

Zeroing Using the Smart Select Knob

☉ To zero the CO₂ sensor using the Smart Select knob:

- 1 Confirm the HeartStart Intrepid is in a clinical mode.
- 2 Confirm that the sampling line has been removed from the patient or that the airway adapter is out of the patient circuit.
- 3 Press the Smart Select knob.
- 4 Turn the Smart Select knob to highlight **Measurements/Alarms** menu and press the Smart Select knob.
- 5 Select **EtCO₂** and press the Smart Select knob.
- 6 Select **Zero** and press the Smart Select knob. The **CO₂ Zero in Progress** message appears on the display. The message disappears when zeroing is finished.

Messages Related to Zeroing the CO₂ Module

For a list of messages that may appear while zeroing the CO₂ module, see [Table 42](#).

Table 42 Messages Related to Zeroing the CO₂ Module

Message	Condition	Possible Solution
CO ₂ Zero in Progress	The CO ₂ sensor is being zeroed.	No action required.
Unable to zero: CO ₂ in the Tube	There is CO ₂ in the sample line.	If patient is not breathing into the tube, zero again.
Unable to zero: CO ₂ Sensor Not Ready	The CO ₂ sensor is still attached to a patient.	If patient is not breathing into the tube, zero again.
	The CO ₂ sensor is warming up.	Allow the sensor to finish warming up and retry zeroing.

EtCO₂ Accuracy

Warm-up Time:

- 20 minutes before full specifications are met over the entire operation temperature range
- Three (3) minutes to fulfill accuracy specifications at an ambient temperature of 25°C

If the EtCO₂ option is enabled, a low priority technical alarm is presented in clinical modes where EtCO₂ monitoring is available, if the EtCO₂ module has not warmed up to operating temperature range.

Sample Gas Humidity: Quantitative effects of humidity and condensation: Full accuracy specifications are maintained for all non-condensing humidity levels.

Airway Pressure Operational Range: +60 cmH₂O (44.1 mmHg) to -60 cmH₂O (-44.1 mmHg). Exceeding the operational range may cause one or more error statuses.

Airway Pressure Maximum Allowable Range: +120 cmH₂O (88.27 mmHg) to -60 cmH₂O (-44.1 mmHg). Exceeding the maximum allowable range may cause damage to the CO₂ module. Airway pressures above 71.4 cmH₂O (52.5 mmHg) will cause an additional error. Example: at 100 cmH₂O (73.6 mmHg) the additional error is 1 mmHg.

Maximum cross-sensitivity compensation error: Additional worst-case error is +/- 1mmHg over the range of 0 – 38 mmHg and an additional +1.3% of actual value when >38 mmHg.

Pressure Compensation: No additional error due to barometric pressure.

Automatic correction on the CO₂ values is performed using internal barometric pressure and sample cell pressure measurements. CO₂ values are normalized to barometric pressure.

Other Interference Sources: There are no known other sources of interference to the gas measurement.

Accuracy in the Presence of Interfering Gases

Balance Gas Compensation: Room Air (N₂), Nitrous Oxide (N₂O), or Helium (He)

Balance Gas Compensation Default: Room Air

Anesthetic Agent Compensation Range: 0 to 20%

Anesthetic Agent Compensation Resolution: 0.1%

Anesthetic Agent Compensation Default: 0%

Agents include Halothane, Enflurane, Isoflurane, Sevoflurane, and Desflurane.

Anesthetic agent effects, Minimum Alveolar Concentration (MAC) levels	Uncompensated sensitivity	Accuracy specification maintained for halogenated anesthetic agents present at accepted MAC clinical levels, ISO 80601-2-55 Table 201.107/YY 0601-2009 Table 107
	Compensated sensitivity	Testing at agent levels defined by accepted regulatory standards, ISO 80601-2-55 Table 201.105/ YY 0601-2009 Table 105

NOTE: The presence of Desflurane in the exhaled breath at concentrations greater than 5% positively biases CO₂ values by up to an additional 3 mmHg at 38 mmHg. Accuracy is not affected by the presence of 0.1% ethanol, 0.1% isopropanol, 0.1% acetone or 1% methane.

Disabling the EtCO₂ Monitoring Function

To disable the EtCO₂ monitoring function, disconnect the tube from the HeartStart Intrepid. The message **CO₂ Tube Unplugged - Turn Off EtCO₂?** appears. Select **Yes** and press the Smart Select knob.

If the airway is disconnected accidentally, the message **CO₂ Tube Unplugged - Turn Off EtCO₂?** appears to indicate the disconnection. Select **No** and press the Smart Select knob. Secure the airway connection. The CO₂ monitoring function is enabled again.

Troubleshooting

If the HeartStart Intrepid does not operate as expected during CO₂ monitoring, see [Table 116 “EtCO₂ Problems”](#) on page 233.

NOTES

[illegible]

Traumatic Brain Injury Advisory

This chapter describes the use of the Traumatic Brain Injury (TBI) advisory feature.

This chapter is divided into the following major sections:

 Overview	p. 141
 Enabling the TBI Advisory	p. 142
 Displaying the TBI Advisory	p. 142
 Disabling TBI Advisory	p. 143
 Troubleshooting	p. 143

Overview

Traumatic Brain Injury (TBI) occurs when an external mechanical force inflicts sudden trauma to the head, causing a disruption in the normal function of the brain. In the absence of obvious head injury, TBI can be difficult to diagnose. Oxygenation and blood pressure are significant parameters associated with outcomes for patients with severe traumatic brain injuries (<http://www.epic.arizona.edu/>).

The TBI advisory feature of the HeartStart Intrepid assists in the monitoring of patients who are determined at high risk of having suffered a traumatic brain injury. The TBI advisory provides visual guidance to help prevent the following conditions:

- Hypoxia. Low blood oxygen saturation (as measured by SpO₂).
- Hypotension. Low systolic blood pressure.
- Hyperventilation-induced hypocapnea. Decreased carbon dioxide in the blood (as measured by EtCO₂).

Even short episodes of these conditions in the early stages of a TBI can quickly lead to vasoconstriction of cerebral arteries, further reducing blood and oxygen flow to damaged brain cells, and to a lower probability of a good cognitive outcome.

The TBI Advisory is available for both adult and infant/child patients on devices in Monitor mode configured with SpO₂, NBP, and EtCO₂. The TBI Advisory display reflects the appropriate target limits for each TBI parameter.

Intended Use Population

The traumatic brain injury (TBI) function is intended for use on:

- Patients 25 kg (55 lb) or over or those 8 years old or over by using the Adult patient category.
- Patients less than 25 kg (55 lb) or under 8 years old by using the Infant/Child patient category.

The TBI function is not intended for use on a neonate (a child within four weeks of birth).

Enabling the TBI Advisory

Note the following:

- The TBI Advisory is only available in Monitor mode and is not available during acquisition of a 12-lead ECG.
- Devices must be configured with SpO₂, NBP, and EtCO₂ measurement parameters, and all three parameters must be in use.
- TBI Advisory can only be enabled when TBI limits are pre-configured on the device.

☉ To enable TBI:

- 1 Ensure an SpO₂ sensor, NBP cuff, and EtCO₂ tubing are connected to the patient.
- 2 Press the [Enable TBI] soft key.
If no patient age has been entered, the **Patient Age** number selector appears.
- 3 If prompted, enter the patient age. When the age is entered, the mode text changes from **Monitor** to **Monitor TBI**, and the patient age is displayed in the status area next to patient name/ID.

Displaying the TBI Advisory

The TBI Advisory display appears in the numeric parameter area. A TBI limit bar is displayed at the top of the corresponding measure box for NBP, EtCO₂, and SpO₂.

NOTE: Physiological alarm conditions have a higher priority than TBI advisory and will obscure TBI indicators.

TBI for Systolic Blood Pressure (SBP)

Systolic blood pressure that is outside the established TBI limits is indicated by a yellow bar, and **TBI SBP > High Limit** or **TBI SBP < Low Limit** is displayed.

Systolic blood pressure that is within the established TBI limits is indicated by a green bar, and **TBI SBP** is displayed.

TBI for EtCO₂

An EtCO₂ value that is outside the established TBI limits is indicated by a yellow bar, and **TBI EtCO₂ > High Limit** or **TBI EtCO₂ < Low Limit** is displayed.

An EtCO₂ value that is within the established TBI limits is indicated by a green bar, and **TBI EtCO₂** is displayed.

TBI for SpO₂

Only a lower limit threshold can be applied to SpO₂. An SpO₂ value that is below the established TBI limit is displayed on a yellow TBI bar, and **TBI SpO₂ < Low Limit** is displayed.

An SpO₂ value that is above the established TBI limit is displayed on a green TBI bar, and **TBI SpO₂** is displayed.

Disabling TBI Advisory

To disable the TBI Advisory, press the **[Disable TBI]** soft key. The display returns to Monitor mode.

Troubleshooting

If your HeartStart Intrepid does not operate as expected when TBI Advisory is enabled, see [“TBI Advisory Problems”](#) on page 241.

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no vertical margin lines or other markings present.

Q-CPR

This chapter is divided into the following major sections:

-  [Overview](#) p. 145
-  [Safety Considerations for Q-CPR](#) p. 147
-  [Using the CPR meter 2](#) p. 147
-  [Understanding the Compression Feedback Indicators](#) p. 151
-  [Using Q-CPR on the HeartStart Intrepid](#) p. 152
-  [After Each Use](#) p. 157
-  [Data and Events Recorded](#) p. 157
-  [Troubleshooting](#) p. 158

Overview

Cardiopulmonary Resuscitation (CPR) is a combination of chest compressions and ventilations delivered to victims in cardiac arrest. The Q-CPR option offers real-time measurement and corrective feedback on the rate, depth, and complete release of compressions, ventilation rate, and lack of CPR activity in accordance with current CPR guidelines. The feedback can appear on the HeartStart Intrepid display and on the CPR meter 2 display (compression feedback only).

Compressions are measured by the CPR meter 2 connected to the HeartStart Intrepid using a Pads/CPR meter 2 cable. Ventilation data is acquired through Philips multifunction defibrillation electrode pads applied to the patient and connected to the HeartStart Intrepid using the same Pads/CPR cable.

Q-CPR is available in Manual mode, AED mode, and Pacer mode (Fixed only). Visual indicators and audio prompts provide feedback to the rescuer when CPR performance deviates outside of target ranges.

When using Q-CPR, SpO₂ monitoring functionality is not available.

NOTE: Q-CPR is deactivated when Sync is activated when entering Monitor, Sync, or Demand Pacing modes.

CPR meter 2

The CPR meter 2 is a small, lightweight device that provides CPR feedback in a display area in the line of sight of the caregiver performing compressions.

Figure 57 Front and Back View

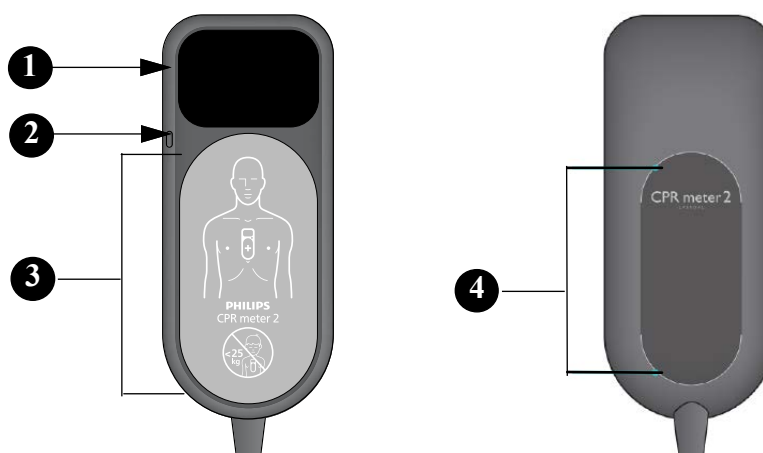


Table 43 CPR meter 2 Components

Number	Component	Description
1	Display area	Provides the compression feedback indicators and status light.
2	Vent	Enables internal and external pressures to equalize. Do not block the vent.
3	Compression area	Used as the hand placement location when performing compressions.
4	Adhesive pad location	Identifies the location to which the adhesive pad is applied.

NOTE: Remove the protective film from the display screen before first use. To prolong the life of the display, avoid storing the CPR meter 2 where it is exposed to direct sunlight when not in use.

Intended Use Population

The Q-CPR function is intended for use on patients 25 kg (55 lb) or over or those 8 years old or over by using the Adult patient category.

Safety Considerations for Q-CPR

Q-CPR is contraindicated for use outside of manual CPR compressions or when CPR therapy is contraindicated. The Q-CPR option is also contraindicated for use on patients under 8 years of age or weighing less than 25 kg (55 lb).

WARNINGS: The Q-CPR option is not intended for use in a moving environment, such as a road ambulance. Additional movement introduced during patient transport may reduce the accuracy of the compression and ventilation measurements. If Q-CPR must be used in a moving environment, do not rely on the Q-CPR feedback during such conditions. It is not necessary to remove the CPR meter 2 from the patient.

Q-CPR is not to be used on patients under 8 years of age or less than 25 kg (55 lb). Q-CPR is not enabled when the Patient Category is set to Infant/Child.

Defibrillation and CPR may cause myocardial injury to the patient.

Properly performed CPR can result in the fracturing of a patient's ribs or other chest injuries, including external chest wall bruising or abrasion. If patient rib or chest integrity has been compromised, continue to provide CPR according to local protocol.

If the CPR meter 2 stops working, is not working as expected or there is uncertainty about the patient's age or the device fitting properly on the patient, remove the CPR meter 2 from the patient and continue CPR according to your organization's protocol.

The Q-CPR option with the CPR meter 2 provides feedback on the performance of CPR. The device does not provide guidance in the decision whether to perform CPR on a suspected cardiac arrest victim. The decision to perform CPR on a suspected cardiac arrest victim must be made independent of whether the CPR meter 2 is used.

If CPR is performed when the patient is lying on a surface that yields, such as a mattress, compression depth feedback from the CPR meter 2 may be misleading, especially if a backboard is not placed under the patient. When a backboard is in place, compensate for mattress compliance by ensuring that each compression exceeds the compression depth on the CPR meter 2 or the generated waveform hits the appropriate line on the HeartStart Intrepid display.

Do not use the Q-CPR option to verify placement of airway adjuncts, such as endotracheal tubes and laryngeal masks. Ventilation feedback accuracy may be decreased when the patient is handled or moved, or when the Q-CPR option is used on patients with certain conditions such as trauma, seizures, reduced lung volume, or high cardiac ejections.

Do not practice with the CPR meter 2 on a person. The CPR meter 2 can be used with a training manikin or on a compliant surface for practice.

CAUTION: The Q-CPR option is not intended for use with any other CPR compression devices.

Using the CPR meter 2

To ensure the CPR meter 2 performs its internal self-checks properly, keep the CPR meter 2 stationary for at least one second when first powered on.

Connecting the Pads/CPR Therapy Cable

A Pads/CPR therapy cable connects the CPR meter 2 to the HeartStart Intrepid. The Q-CPR option is operational only when the Pads/CPR cable is connected to the HeartStart Intrepid. CPR feedback is not available if the standard pads or paddles cable is connected.

© To connect the Pads/CPR therapy cable:

- 1 Align the white pointer on the cable with the white arrow on the green Therapy port as shown in Figure 58.
- 2 Insert the cable into the green Therapy port. Push until it clicks into place. As a time saving measure, it is possible to choose to always keep the Pads/CPR cable pre-connected to the HeartStart Intrepid.

Figure 58 Connecting the Pads/CPR Therapy Cable



Connecting the CPR meter 2 to the Pads/CPR Therapy Cable

To save time, keep your CPR meter 2 cable connected to the CPR cable on the HeartStart Intrepid.

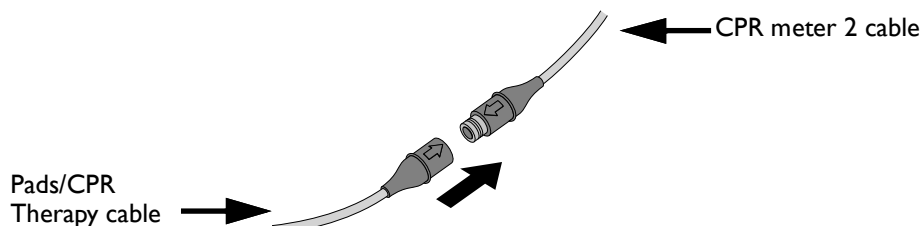
When connecting the CPR meter 2 to the HeartStart Intrepid, ensure you understand the status light that appears in the CPR meter 2 display area:

- The status light is briefly green when the CPR meter 2 is connected or disconnected from the HeartStart Intrepid. If the status light does not light when first connected, remove the CPR meter 2 from service.
- During normal operation, the status light is not lit.
- An orange status light indicates an error. Remove the CPR meter 2 from use. If the status light is orange during an event, stop using the CPR meter 2 and continue CPR. Contact your local Philips representative after the event.

© To connect the CPR meter 2 to the Pads/CPR Therapy cable:

- 1 Align the arrow on the CPR meter 2 cable with the arrow on the receptacle end of the Pads/CPR cable as shown in [Figure 59](#). To save time, keep the CPR meter 2 cable preconnected to the Pads/CPR therapy cable.
- 2 Push until it snaps into place. There should be no gap between the two connectors.

Figure 59 **Pads/CPR Therapy Cable connection**



Connecting Multifunction Electrode Pads

Philips multifunction electrode pads are required to measure ventilation activity as well as acquire an ECG signal and deliver a shock, as appropriate.

WARNING: Anterior-posterior pad placement should not be used with the Q-CPR option.

© To connect multifunction electrode pads:

- 1 Check the expiration date on the pads package and inspect the package for any damage. Discard expired or damaged pads.
- 2 Ensure the Therapy cable is connected to the HeartStart Intrepid.
- 3 Connect the pads connector to the Pads/CPR Therapy cable. See [Figure 60](#).
- 4 Apply the pads to the patient in the anterior/apex position as shown on the pads package.

Figure 60 **Connecting Multifunction Electrode Pads**



Attaching the CPR meter 2 Adhesive Pad

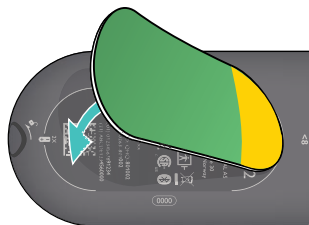
You must attach an adhesive pad to the back of the CPR meter 2 before using with a patient.

WARNING: The CPR meter 2 adhesive pad is intended for single-patient use only. Replace after each use. Check the label on the outside packing to confirm the adhesive pads are within their expiration date. Do not use pads beyond their expiration date.

CAUTION: The CPR meter 2 should always be stored with the CPR meter 2 adhesive pad applied. As directed in the instructions, the CPR meter 2 must be used with the adhesive pad in place.

- ☉ To attach the CPR meter 2 adhesive pad:
- 1 Confirm that the CPR meter 2 pads are within their expiration date, and open the package of adhesive pads.
 - 2 Peel one pad off the strip, exposing the adhesive surface on the underside. Apply the pad to the back of the CPR meter 2, covering the entire flat oval surface. See [Figure 61](#).
 - 3 Do not peel off the green and yellow liner from the front of the pad until ready to apply the device to a patient.

Figure 61 **CPR meter 2 Adhesive Pad**



Placing the CPR meter 2 on the Patient

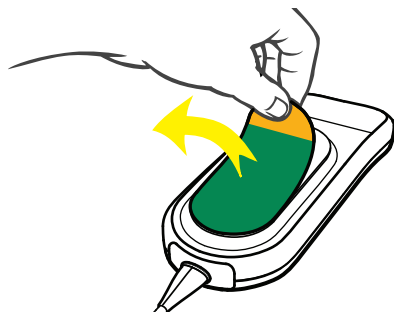
WARNINGS: Do not apply the CPR meter 2 to an open wound or recent incision site.

Do not use the CPR meter 2 in conjunction with any mechanical or automated compression device.

If the CPR meter 2 stops working, isn't working as expected or there is uncertainty about the patient's age or the device fitting properly on the patient, remove the CPR meter 2 from the patient and continue CPR according to organizational protocol.

- ☉ To place the CPR meter 2 on the patient:
- 1 Ensure the patient's skin is clean and dry. If necessary, clip or shave the hair from the sternum area.
 - 2 Peel off the green liner from the CPR meter 2 adhesive pad to expose the adhesive surface.

Figure 62 **Exposing the Adhesive Surface**



- 3 Position the CPR meter 2 so the compression area is placed on the lower half of the sternum, on the centerline of the bare chest as illustrated on the front of the CPR meter 2 and in [Figure 63](#).
 - The CPR meter 2 may overlap the defibrillator pad.
 - If difficult to apply the CPR meter 2, do not delay CPR. Remove the CPR meter 2 and begin compressions.
 - If the CPR meter 2 moves during use, reposition it correctly in the center of the chest.

Figure 63 **CPR meter 2 Placement**

Performing CPR with the CPR meter 2

- © To perform CPR with the CPR meter 2:
- 1 Using standard CPR technique, place the heel of one hand directly over the compression area of the attached CPR meter 2.
 - 2 Place your other hand on top of the first and interlock your fingers. Ensure you can see the display area of the CPR meter 2.
 - 3 Provide chest compressions according to organizational CPR protocol:
 - If you are not familiar with the CPR meter 2 or suspect a problem with it, disregard feedback from the CPR meter 2 and continue with CPR.
 - When the CPR meter 2 first detects compressions, initial targets for compression depth, release, and rate are shown.

Understanding the Compression Feedback Indicators

The CPR meter 2 provides feedback for CPR compression depth, release, and rate:

- For adequate compression depth and release, the compression depth indicator must reach the compression depth target and compression release target for each compression.
- For adequate compression rate, the compression rate indicator must remain in the compression rate target. If the compression rate indicator is left of the compression rate target, compressions are too slow. If the compression rate indicator is right of the compression rate target, compressions are too fast.

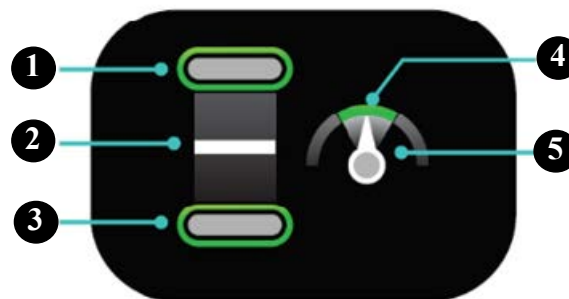
Figure 64 **Compression Feedback Indicators**

Table 44 **Compression Feedback Indicators**

Number	Feedback Indicator
1	Compression release target
2	Compression depth indicator
3	Compression depth target
4	Compression rate target
5	Compression rate indicator

Table 45 **CPR meter 2 Display Images**

Display Image	Name	Description
	Perform CPR	If compressions are stopped for 10 seconds, the Perform CPR image appears and flashes to indicate that CPR should be resumed. If compressions are not resumed, the HeartStart Intrepid provides voice prompts.
	Do not touch the patient	The Do not touch the patient image appears in the following circumstances: • The HeartStart Intrepid is analyzing the heart rhythm. • The HeartStart Intrepid is charging. • The HeartStart Intrepid instructs that a shock is advised.
	Service required	The Service required image appears when the number of compressions performed on the CPR meter 2 reaches the service limit (500,000 compression cycles). If service is required, remove the CPR meter 2 from use and contact your local Philips representative.

Using Q-CPR on the HeartStart Intrepid

Q-CPR feedback is displayed on the CPR meter 2 and on the HeartStart Intrepid screen. The HeartStart Intrepid can display the following parameters, depending upon configuration. See [Figure 66](#):

- Compression rate
- Compression wave showing compression depth
- No flow time (shown as **No CPR sec** on the display)
- Ventilation rate
- CPR Timer
- Compression counter

If the HeartStart Intrepid is equipped with the EtCO₂ option, the display also provides:

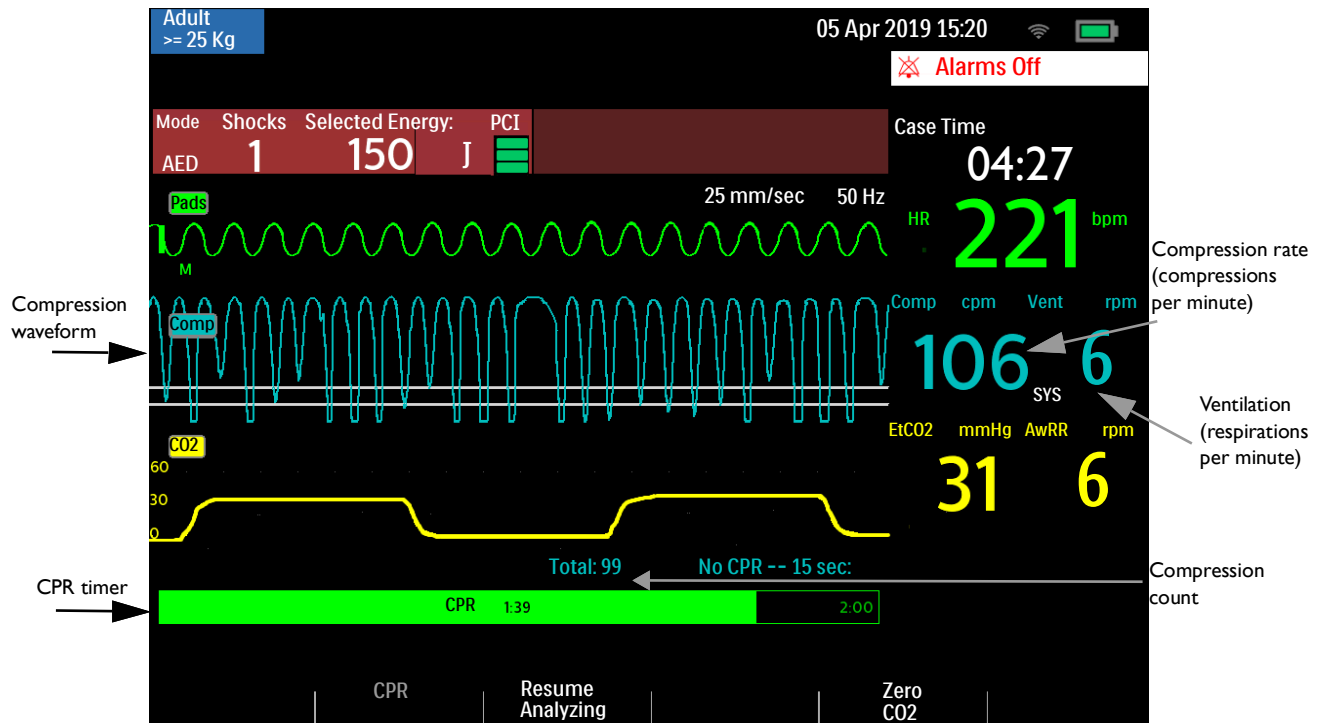
- EtCO₂ numeric (if available)
- CO₂ wave (if available)

Shut down the HeartStart Intrepid before disconnecting the CPR meter 2. Failure to do so may delay the appearance of the customer service indicator on the CPR meter 2.

Using Q-CPR in AED Mode

In AED mode, CPR feedback is provided automatically during the CPR Pause period of the AED protocol or manually when the CPR Pause soft key is pressed. If the No Shock Advised (NSA) Action configuration item is set to provide a CPR Pause interval, Q-CPR can be activated by delivering a compression with the CPR meter 2. Voice instructions are issued as guidance.

Figure 65 Q-CPR Display in AED Mode



AED Soft Keys

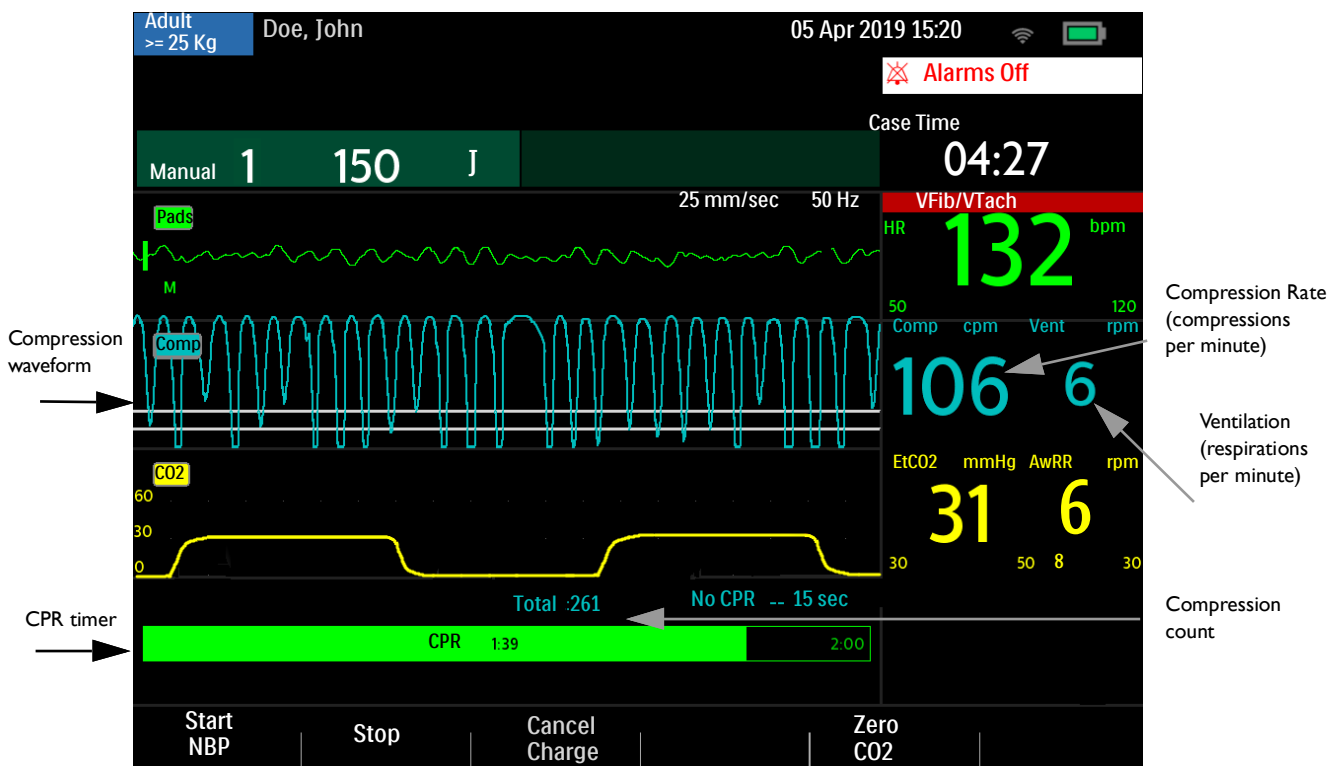
AED mode has two soft keys available;

- CPR - Pressing the CPR soft key initiates the configured pause period to perform CPR.
- Resume Analyzing - Pressing the Resume Analyzing soft key initiates the AED analysis algorithm to resume or restart analysis.

Using Q-CPR in Manual Defibrillation Mode

In Monitor mode, when the Therapy knob is moved to a Manual Defibrillation setting, the CPR View is automatically displayed only if the patient category is Adult and compressions are detected. If CPR voice instructions are not enabled, **CPR Voice Muted** displays beneath the progress bar.

Figure 66 Q-CPR View



Soft Keys

To stop CPR, press the [Stop CPR] soft key. To start CPR, press the [CPR Timer] soft key.

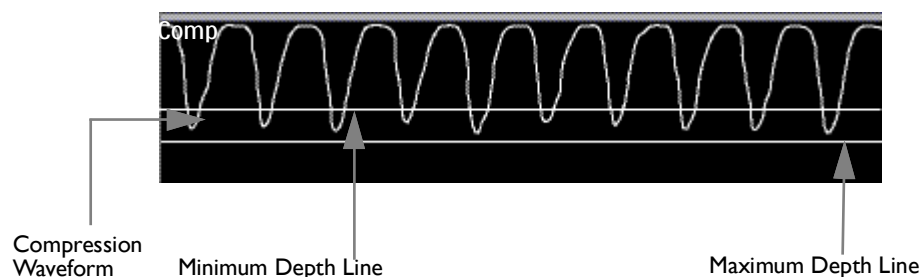
CPR Compression Depth Guidelines

WARNING: When doing CPR on a patient lying on a surface that yields, do not use the CPR meter 2 if a backboard is not in place.

The HeartStart Intrepid Q-CPR Views display two guidelines on the screen:

- The minimum depth line is 50 mm (2 in). It indicates the minimum depth of CPR compressions when the patient is on a firm surface. CPR compression waves should drop below this line.
- The maximum depth line is 60 mm (2.4 in). It indicates the maximum depth of CPR compressions when the patient is on a firm surface. CPR compression waves should stay on or above this line.

Figure 67 HeartStart Intrepid Compression Depth Guidelines



Good compression depth is achieved when the peak, or minimum value, of the compression waveform appears between the lines. When pressure is not released between compressions, an asterisk (*) will annotate the baseline segment between compressions. This is also referred to as “leaning.” If the signal from the CPR meter 2 becomes invalid (for example, the meter is disconnected), the waveform appears as a dashed line.

NOTES: If the Pads/CPR cable is not connected when you turn the Therapy knob to AED mode, the message **Connect Pads Cable** is displayed.

Compression measurement value is printed in the annotation area of the ECG printed strip.

CPR Voice Instructions and Screen Messages

The following table describes the feedback voice instructions and screen messages that may be issued from HeartStart Intrepid during the use of the CPR meter 2.

Table 46 CPR User Messages

HeartStart Intrepid Voice Instruction	HeartStart Intrepid Screen Message	Condition
“Compress deeper”	Same as voice instruction	Compression depth too shallow
“Compress faster”	Same as voice instruction	Compression rate too slow
“Slow down compressions”	Same as voice instruction	Compression rate too fast.
“Release fully between compressions”	Same as voice instruction	Incomplete release of compression resulting in residual pressure on the patient’s chest
“Ventilate less often”	Same as voice instruction	Ventilation rate too high
“No compressions detected”	Same as voice instruction	Compression inactivity or not detected

Table 46 **CPR User Messages (Continued)**

HeartStart Intrepid Voice Instruction	HeartStart Intrepid Screen Message	Condition
“Press pads firmly to patient’s bare skin.” (AED mode only)	Press pads firmly	Poor pads contact
“Insert connector firmly Apply Pads.” (AED mode only)	Insert Connector, Apply Pads	The CPR meter 2 is not connected properly or pads not applied
N/A	Do Not Use CPR Meter in Infant/Child Mode	The CPR meter 2 is connected while in infant/child mode

Adjusting the Volume of the CPR Voice Instructions

- ⊙ To adjust the volume of CPR voice instructions in Manual or Pacer mode:
 - 1 Press the Smart Select knob.
 - 2 Use the Smart Select knob to select **Volume**.
 - 3 Use the Smart Select knob to select **Voice**.
 - 4 Select the volume level and press the Smart Select knob. A sample voice instruction is given at the select volume.
- ⊙ To adjust the volume of CPR voice instructions in AED mode:
 - 1 Press the Smart Select knob.
 - 2 Select **Voice Volume**.
 - 3 Select the voice value.
 - 4 Choose the volume.
 - 5 Press the Smart Select knob to confirm the selection.

CPR voice instructions may also be muted. When muted, a **CPR Voice Muted** message displays below the CPR progress bar. CPR inactivity time is indicated by an audible tone.
- ⊙ To mute the CPR voice instructions:

Mute is only available when Q-CPR is active.

 - 1 Press the Smart Select knob.
 - 2 Use the Smart Select knob to select **Mute CPR voice**.
- ⊙ To resume CPR voice instructions set at the previously selected volume:
 - 1 Press the Smart Select to confirm the prompt.
 - 2 Press the Smart Select knob again to select **Activate CPR Voice**.

After Each Use

The CPR meter 2 and its vent should be inspected after each use and cleaned if necessary. Remove the CPR meter 2 adhesive pad from the CPR meter 2 and follow the cleaning directions listed in the Maintenance chapter.

Have a trained user perform chest compressions with the CPR meter 2 on a CPR manikin. If the CPR meter 2 does not function as expected, remove it from use and contact a Philips representative.

Data and Events Recorded

The HeartStart Intrepid records CPR data in Manual Defibrillation and AED modes:

- Recording starts when a CPR meter 2 is detected.
- Recording stops when you remove the CPR meter 2 or you exit Manual Defibrillation or AED mode.

CPR-related data and events that are logged in the event data record are shown in [Table 47](#). The information is not included in the Event Summary report printed by the HeartStart Intrepid.

Table 47 Q-CPR Captured Data in Event Data Record

Captured Data	Description
Compression Waveform	Waveform showing compression depth versus time.
Ventilation Waveform	Waveform showing change in chest impedance over time.
Compression event	Compression occurs
Ventilation event	Ventilation occurs
Compression rate	Rate of compressions
Compression depth	Depth of compression
Ventilation rate	Rate of ventilation
Level 2 feedback	Visual feedback (arrow) on the CPR meter 2 is displayed if some aspect of the CPR performed does not conform to CPR guidelines.
Level 3 feedback	Verbal feedback announced if some aspect of the CPR performed continues to fall outside CPR guidelines after Level 2 feedback is given.

Research Storage Setting

When Research Storage is enabled, in addition to the data and events listed in [Table 47](#) the following data is captured:

Table 48 Q-CPR Research Storage Captured Data

Captured Data	Description
Acceleration waveform	CPR meter 2 acceleration data
Chest force waveform	CPR meter 2 force data
PCI waveform	Patient Contact Impedance (PCI) from multifunction electrode pads

Q-CPR Alarms

The following table lists alarms associated with Q-CPR.

Table 49 **Q-CPR Alarms**

Alarm Message	Condition	Type of Alarm	Indication
CPR Meter Malfunction	Corrupt CPR meter 2	Low Priority Non-Latching Alarm	Alarm message with audio tone or prompt.
	CPR meter 2 failure		
	CPR meter 2 self-test failure		
CPR Meter Disconnected	CPR meter 2 is unplugged or cannot communicate		
CPR Meter Power Overload	CPR meter 2 power overload is detected.		
Noisy Vent Signal	Excessive noise on the impedance signal.		
Incompatible CPR Meter	The CPR meter 2 attached is not compatible with the current version of the device software.		

Reviewing Q-CPR Data

To review Q-CPR data, copy the event data from the HeartStart Intrepid internal memory to a USB drive or transmit to a data management application.

Troubleshooting

If the HeartStart Intrepid does not operate as expected during Q-CPR, see [“Troubleshooting”](#) on page 227.

Configuration

This chapter describes the configurable parameters of the HeartStart Intrepid and procedures for modifying configuration.

This chapter is divided into the following major sections:

	Overview	p. 159
	Working in Configuration Mode	p. 160
	Configurable Parameters	p. 163

Overview

The settings and configurations of the device's electronic interface are initially configured based on factory defaults. Configuration is viewed and changed through the Configuration menu. A password is required to change and save your device's configuration. See the insert that is shipped with your device to access the Configuration password.

NOTE: As you are making configuration choices, consider all the clinical environments the HeartStart Intrepid may be used in. Choices for one department might not be suitable for another department.

Entering Configuration Mode

Use Configuration mode to view, print, export/import configuration settings, change the date and time, and change and save configuration settings. New configuration settings are saved by pressing the **[Save]** soft key. Entering the Configuration password is required to save all changes except the date and time.

WARNING: Do not perform configuration activities while the HeartStart Intrepid is connected to a patient.

⦿ To access **Configuration mode**:

- 1 Turn the Therapy knob to Monitor, Manual Defibrillation, or Pacer.
- 2 Press the Smart Select knob.
- 3 Turn the Smart Select knob to highlight **Other** and press the Smart Select knob.
- 4 Select **Configuration** and press the Smart Select knob. The prompt **Exit Clinical Mode?** appears.
- 5 Select **Yes** to exit clinical mode and enter the Configuration screen.
- 6 Press the Smart Select knob to access the Configuration menu.
- 7 To confirm the selection, select **Yes** and press the Smart Select knob. If **No** is selected, the device returns to the original mode.

Once in Configuration mode, press the **[Exit Config]** soft key to return to clinical operation.

Working in Configuration Mode

WARNING: Configuration affects the device behavior. It is your responsibility to keep the device configuration in accordance with your institution guidelines.

Setting the Date and Time

Date and time are the only configuration parameters you can change without entering the configuration password.

⊙ To change the date and time:

- 1 Once in Configuration mode, press the Smart Select knob.
- 2 Select **Date/Time** and press the Smart Select knob. The Configuration Date/Time screen appears.

Figure 68 **Date and Time Settings**

Configuration - Date/Time	
Time Zone	UTC-5 (82.5°W – 67.5°W)
Date/Time Format	Standard
Year	2019
Month	Jan
Day	12
Hour	23
Minute	34

- 3 Use the Smart Select knob to select the entry you want to change and press the Smart Select knob.
- 4 Change the value, and press the Smart Select knob.
- 5 Select another value for modification or press the **[Main Config]** soft key to save changes and return to the main Configuration screen.

Changing Settings

⊙ To change default settings in Configuration mode:

- 1 Press the Smart Select knob and select the menu item to be changed, then press the Smart Select knob.
- 2 Select the submenu item to be changed, then press the Smart Select knob.
- 3 Select a new value and press the Smart Select knob.
- 4 If necessary, use the **[Next Screen]** and **[Previous Screen]** soft key to advance to other configuration menus and repeat steps 1 – 3 to make additional changes.
When your changes are complete, press the **[Main Config]** soft key to return to the Configuration Main screen.

- 5 Press the **[Save/Discard]** soft key to save the new configuration. The **Save/Discard All Changes?** dialog appears.
 - Press **Save** to save the changes.
 - Press **Discard** to discard the changes.
 - Press **Exit** to return to the Configuration Main screen.
- 6 If **Save** is selected, follow the prompt to enter the configuration password:
 - a Use the Smart Select knob to select the first digit and press the Smart Select knob.
 - b Use the Smart Select knob to enter the remaining digits of the password.
 - c When finished, select **OK** and press the Smart Select knob.
- 7 Press the **[Exit Config]** soft key to return to normal operating mode.
 If you made changes and press the **[Exit Config]** soft key before saving changes, then the **Configuration Not Saved - Exit Anyway?** dialog appears.
 - If you want to save the changes, select **No**, press the Smart Select knob, and press the **[Save Changes]** soft key to save the new configuration.
 - If you do not want to save the configuration, select **Yes** and press the Smart Select knob to exit Configuration mode.

If you accidentally saved a wrong configuration, see [“Restoring Default Settings”](#) on page 162.

Changing the Data Management Mode Password

You can change the Data Management mode password from the **Change DataMgmt Password** screen. The Data Management mode password must be at least eight characters.

- © To change the Data Management mode password:
- 1 In the **New Password** field, enter a new password.
 - 2 In the **Confirm Password** field, re-enter the new password.
 - 3 In the **Configuration Password** field, enter the Configuration mode password.
 - 4 Press the **[Save]** soft key to save the password.

NOTE: It is recommended to write down the Configuration mode and Service mode passwords and store them in a secure location. Refer to the insert that shipped with your device for default password information for Configuration and Data Management modes.

Exporting Settings

- © To export configuration settings to a USB drive:
- 1 Confirm you have a USB drive inserted into the USB port, and you are in Configuration mode.
 - 2 If you made any changes in configuration, make sure to either save or discard the changes.
 - 3 Press the **[Export]** soft key.
- The HeartStart Intrepid copies the current configuration to the USB drive.

NOTE: If you already have a configuration stored on the USB drive, exporting another to the USB drive overwrites the one already on the drive.

Importing Settings

- ⦿ To import configuration settings from a USB drive:
 - 1 Enter Configuration mode.
 - 2 Save the existing configuration to a USB drive as a back up.
 - 3 Insert the USB drive with the saved settings to be imported.
 - 4 Press the **[Import]** soft key. The HeartStart Intrepid copies the current configuration from the USB drive. The imported configuration does not become effective until saved.
 - 5 Make any device-specific configuration changes.
 - 6 Review the changed configuration before saving.
 - 7 Press the **[Save/Discard]** soft key to save the new configuration. The **Save/Discard All Changes?** dialog appears.
 - Press **Save** to save the changes.
 - Press **Discard** to discard the changes.
 - Press **Exit** to return to the Configuration Main screen.
 - 8 If **Save** is selected, follow the prompt to enter the configuration password:
 - a Use the Smart Select knob to select the first digit and press the Smart Select knob.
 - b Use the Smart Select knob to enter the remaining digits of the password.
 - c When finished, select **OK** and press the Smart Select knob.
 - 9 Press the **[Exit Config]** soft key to return to normal operating mode.

NOTE: If your device attempts to import a configuration parameter not supported in your version or options set, you may see a **xxx Setting Not Supported** technical alarm.

Printing Configuration Settings

Ensure you have enough paper and allow enough time to print the configuration settings. The report lists general settings and then the configured device settings.

- ⦿ To print configuration settings:
 - 1 In Configuration mode, press the Smart Select knob.
 - 2 Using the Smart Select knob, select **Print Configuration**.
 - 3 Press the Smart Select knob to print the report. To stop printing, press the Print button .

Restoring Default Settings

- ⦿ To return all configuration settings to those originally set during manufacturing:
 - 1 Once in Configuration mode, press the **[Factory Defaults]** soft key.
 - 2 The **Reset Configuration to Factory Defaults?** dialog appears.
 - If you want to reset the configuration, select **Yes** and press the Smart Select knob.
 - If you do not want to reset the configuration, select **No** and press the Smart Select knob to return to Configuration main screen.

Configurable Parameters

The following tables list configurable parameters for the HeartStart Intrepid. Default settings are in bold type. Values are adjusted in increments of 1 unless otherwise stated.

Date and Time Settings

You can change these settings without entering the configuration password.

Table 50 Configuration – Date/Time

Parameter	Description	Setting Choices
Time Zone	Defines the time zone.	UTC (7.5°W – 7.5°E) through UTC 12(172.5°E – 172.5°W) and UTC-1 (22.5°W – 7.5°W) through UTC-11 (172.5°W – 157.5°W)
Date/Time Format	Defines whether Daylight Saving Time is used.	Standard , DST
Default values are the current date, time, and time format.		

Date/Time Format Settings

Saving changes to date and time settings requires the Configuration password.

Daylight Saving Time (DST) changes occur when the next event is started. The time does not change in the middle of an event that crosses over the DST change.

Use the ◀ and ▶ soft keys to navigate between: DST Start Setting and DST End Setting.

Table 51 Configuration – Date/Time Format

Parameter	Description	Setting Choices	
Time Format	Defines the time format.	12-Hour, 24-Hour	
Date Format	Defines the date format.	DD Mon YYYY , YYYY-MM-DD (D = Day, Mon or M =Month, Y=Year)	
Auto Daylight Saving Time (DST)	Defines whether or not your device auto corrects for DST.	Yes, No	
DST Offset	Defines the hour and minute time shift during DST.	±2 hours, +1 hour adjusted in 30 minutes increments	
		DST Start Setting	DST End Setting
Month	The month DST begins/ends.	Any of the 12 months, Mar	Any of the 12 months, Nov
Week of Month	The week DST begins/ends.	First , Second , Third, Fourth, Last	First , Second, Third, Fourth, Last
Day of Week	The day DST begins/ends.	Sun , Mon, Tues, Wed, Thu, Fri, Sat	

Table 51 **Configuration – Date/Time Format** (*Continued*)

Parameter	Description	Setting Choices
Hour	The hour DST begins/end.	00-23 (if 24-hour format); 01-12 (if 12-hour format), 02
Minute	The minute DST begins/end.	00-59, 00
am/pm	Shown if the 12-hour format is chosen.	am, pm

General Settings

Your general configuration settings customize your HeartStart Intrepid to your healthcare institution environment.

Table 52 **Configuration – General**

Parameter	Description	Setting Choices
Institution Name	Name of your organization to be used in applicable HeartStart Intrepid reports.	up to 32 characters, blank
Facility ID	ID of the facility to be used in applicable HeartStart Intrepid reports.	up to 5 alpha-numeric characters including period, slash, hyphen and space, blank
Department ID	ID of the department to be used in applicable HeartStart Intrepid reports.	up to 10 alpha-numeric characters including period, slash, hyphen and space, blank
Device ID	Enters a device identification number.	up to 4 digits, blank
Patient Category	Selects the default patient category.	Adult , Infant/Child
Alarm Tone	Defines whether traditional Philips or IEC standard alarm tones are used.	Philips , IEC
Alarm Pause Time	Defines the interval of time during which alarms are paused after the Alarm button is pressed.	1 min , 2 min , 3 min, 5 min, 10 min, Indefinite
Alarm Volume	Defines the volume of alarms. A volume that is less than the current Minimum Alarm Volume cannot be selected.	Very Soft , Soft, Medium , Loud, Very Loud
Minimum Alarm Volume	Defines the minimum volume of alarms for the device.	Very Soft , Soft, Medium , Loud, Very Loud
Voice Volume	Defines the volume of voice instructions.	Very Soft , Soft, Medium , Loud, Very Loud
QRS Volume	Defines the volume of beeps with each QRS complex detected.	Off, Very Soft , Soft, Medium , Loud, Very Loud

Table 52 **Configuration – General (Continued)**

Parameter	Description	Setting Choices
Units Display	Defines whether parameter values are displayed with the corresponding measurement units.	On, Off
Export Without Patient Info	Defines whether the user is prompted to de-identify data before exporting clinical data.	Prompt, Disabled
Data Management Password Required	Defines whether the Data Management mode password is required to print, export, export all, transmit event, or remove all patient data	On, Off
Patient Information to Display	Defines the type of patient information that is displayed.	Name, ID, None
Latch All Physiological Alarms	Defines whether all physiological alarms are latched when first displayed.	No, Yes
Alarm Audio Off Reminder	Defines whether the device provides a reminder every three minutes when alarms are suspended indefinitely.	On, Off

Monitoring Settings

The monitoring settings customize your HeartStart Intrepid to your institution's clinical monitoring guidelines. Use the ◀ and ▶ soft keys to navigate between: **Adult** and **Infant/Child**. Table 53 lists the Heart Rate and ECG monitoring settings.

Table 53 **Configuration – HR/ECG**

Parameter	Description	Setting Choices
Color	Selects the HR/ECG color.	Red, Yellow, Blue, Green , Cyan, Magenta, White
Auto-Gain	Determines whether ECG size is automatically adjusted to the maximum wave size without clipping the wave sector. If auto-gain is off, the gain is set to x1 (10 mm/mV). Adjusting the ECG wave size on the display does not affect the ECG signal that is used for arrhythmia analysis.	On, Off
AC Line Filter	Selects the setting used to filter out AC line noise from ECG data. Adjust setting to the power frequency of your country.	50 Hz, 60 Hz
ECG Bandwidth For Display	Selects the ECG bandwidth used for the HeartStart Intrepid display. <i>Note:</i> If the ECG source is pads or paddles, Monitor is used, regardless of the configuration setting.	0.15-40 Hz , 0.05-40 Hz, 2.20-20 Hz

Table 53 **Configuration – HR/ECG (Continued)**

Parameter	Description	Setting Choices	
ECG Bandwidth For Printer	Selects the ECG bandwidth used for printing.	0.05-150 Hz Diagnostic, 0.05-40 Hz, 0.15-40 Hz, 2.0-20 Hz	
ECG Electrode Labels	Selects the electrode label format. AAMI: RA, LA, LL, RL, V (V1-V6); IEC: R, L, F, N, C (C1-C6).	AAMI, IEC	
HR/Arrhythmia Alarms	Selects if HR/Arrhythmia alarms are on or off at start up.	On, Off	
Display Rhythm Status	Determines if the rhythm status is seen on the display with the primary ECG wave in all clinical modes (except AED).	On, Off	
		Adult	Infant/Child
HR/Pulse High Limit	Selects the default High / Low alarm limit for the HR derived from the ECG and the pulse derived from SpO ₂ .	35-300, 120 bpm	35-300, 160 bpm
HR/Pulse Low Limit		30-295, 50 bpm	30-295, 80 bpm
VTACH HR Limit		95-150, 100 bpm	95-150, 120 bpm
VTACH Run Limit	Selects the VTach run limit.	3-20, 5	
PVC Rate Limit	Selects the PVC limit.	1-99, 10	1-99, 5

Table 54 lists the noninvasive blood pressure (NBP) monitoring settings.

Table 54 **Configuration – NBP**

Parameter	Description	Setting Choices
Color	Selects the NBP color.	Red, Yellow, Blue, Green, Cyan, Magenta, White
Unit	Selects the measurements units.	mmHg , kPa
NBP Frequency	Selects the frequency for NBP measurement: manual or automatic on a selected schedule.	Manual , q1, q2.5, q5, q10, q15, q30, q60, q120
NBP Alarm Source	Selects the alarm source.	Systolic , Diastolic, Mean
NBP Alarms	Selects if NBP alarms are on or off at start up.	On , Off

Table 54 **Configuration – NBP (Continued)**

Parameter	Description	Setting Choices	
		Adult	Infant/Child
Systolic High Limit	Selects the High / Low limit alarm value when systolic / diastolic / mean is the selected alarm source. Adjusted in increments of 5 mmHg / 0.5 kPa	35 – 270, 160 mmHg ; 4.5 – 36.0, 21.0 kPa	35 – 130, 120 mmHg ; 4.5 – 17, 16.0 kPa
Systolic Low Limit		30 – 265, 90 mmHg ; 4.0 – 35.0, 12.0 kPa	30 – 125, 70 mmHg ; 4.0 – 16.5, 9.0 kPa
Diastolic High Limit		15 – 245, 90 mmHg ; 2.0 – 32.5, 12.0 kPa	15 – 100, 70 mmHg ; 2.0 – 13.0, 9.0 kPa
Diastolic Low Limit		10 – 240, 50 mmHg ; 1.5 – 32.0, 7.0 kPa	10 – 95, 40 mmHg ; 1.5 – 12.5, 5.0 kPa
Mean High Limit		25 – 255, 110 mmHg ; 3.5 – 34, 15.0 kPa	25 – 120, 90 mmHg ; 3.5 – 16.0, 12.0 kPa
Mean Low Limit		20 – 250, 60 mmHg ; 3.0 – 33.0, 8.0 kPa	20 – 115, 50 mmHg ; 3.0 – 15.0, 7.0 kPa

Table 55 lists the pulse oximetry (SpO₂) monitoring settings.

Table 55 **Configuration – SpO₂**

Parameter	Description	Setting Choices	
Color	Selects the SpO ₂ color.	Red, Yellow, Blue, Green, Cyan , Magenta, White	
SpO2 Alarms	Selects if SpO ₂ alarms are on or off at start up.	On, Off	
		Adult	Infant/Child
SpO2 High Limit	Selects the High alarm limit value.	51 – 100, 100%	51 – 100, 100%
SpO2 Low Limit	Selects the Low alarm limit value.	50 – 99, 90%	50 – 99, 90%
SpO2 Desat Limit	Selects the extreme low limit alarm value.	50 – (SpO2 Low Limit), 80%	30 – (SpO2 Low Limit), 80%

Table 56 lists the end-tidal CO₂ (EtCO₂) monitoring settings.

Table 56 **Configuration – EtCO₂ / AwRR**

Parameter	Description	Setting Choices
Color	Selects the EtCO ₂ color.	Red, Yellow , Blue, Green, Cyan, Magenta, White
Unit	Selects the measurements units.	mmHg , kPa
EtCO2 Alarms	Selects if EtCO ₂ alarms are on or off at startup.	On, Off

Table 56 Configuration – EtCO₂ / AwRR (Continued)

Parameter	Description	Setting Choices	
AwRR Alarms	Selects if AwRR alarms are on or off at startup.	On, Off	
		Adult	Infant/Child
EtCO ₂ High Limit	Selects the EtCO ₂ High alarm limit value.	20 – 99, 50 mmHg 2.7 – 13.2 kPa, 6.7 kPa	20 – 99, 50 mmHg 2.7 – 13.2 kPa, 6.7 kPa
EtCO ₂ Low Limit	Selects the EtCO ₂ Low alarm limit value.	10 – 95, 30 mmHg 1.3 – 12.7 kPa, 4.0 kPa	10 – 95, 30 mmHg 1.3 – 12.7 kPa, 4.0 kPa
AwRR High Limit	Selects the AwRR High alarm limit value.	10 – 100, 30 rpm	10 – 100, 60 rpm
AwRR Low Limit	Selects the AwRR Low alarm limit value.	0 – 99, 8 rpm	0 – 99, 12 rpm
Apnea Time	The length of time without respiration required to trigger an apnea alarm.	10 – 40, 20 sec	10 – 40, 20 sec

If the HeartStart Intrepid has the SpO₂, EtCO₂, and NBP options installed, TBI settings shown in [Table 57 “Configuration – TBI Advisory”](#) are available in the Configuration menu. These settings are blank by default and must be configured to enable the TBI function.

Table 57 Configuration – TBI Advisory

Parameter	SPO ₂ Lower Limit	SBP Lower Limit	SBP Upper Limit	EtCO ₂ Lower Limit	EtCO ₂ Upper Limit
Infant: < 1 year	20-100	30-265 mmHg	35-270 mmHg	10-95 mmHg	20-99 mmHg
Child: 1 year to ~ 15 years (puberty)	20-100	30-265 mmHg	35-270 mmHg	10-95 mmHg	20-99 mmHg
Adult: ≥ 16 years	20-100	30-265 mmHg	35-270 mmHg	10-95 mmHg	20-99 mmHg

[Table 58](#) lists the temperature monitoring settings.

Table 58 Configuration – Temperature

Parameter	Description	Setting Choices
Color	Selects the Temperature color.	Red, Yellow, Blue, Green , Cyan, Magenta, White
Unit	Selects the measurements units.	°C, °F
Temperature Alarms	Selects if Temperature alarms are on or off at start up.	On, Off

Table 58 Configuration – Temperature (Continued)

Parameter	Description	Setting Choices	
		Adult	Infant/Child
Temp High Limit	Selects the Temperature High alarm limit value.	0.1 – 45.0°C, 39.0°C 32.2 – 113°F, 102.2°F	0.1 – 45.0°C, 39.0°C 32.2 – 113°F, 102.2°F
Temp Low Limit	Selects the Temperature Low alarm limit value.	0.0 – 44.9°C, 36.0°C 32.0 – 112.8°F, 96.8°F	0.0 – 44.9°C, 36.0°C 32.0 – 112.8°F, 96.8°F

Therapy Delivery Settings

The therapy delivery settings customize the way your HeartStart Intrepid delivers therapy. [Table 59](#) lists the Manual Defibrillation and Sync mode settings.

Table 59 Configuration – Defib/Sync

Parameter	Description	Setting Choices
1-10 Joules Default	Defines the device's low-energy setting.	1, 2, 3, 4, 5, 6 , 7, 8, 9, 10 Joules
Remain In Sync Mode After Shock	Defines if the device remains in Sync mode after a delivered shock.	Yes , No
Time To Auto Disarm	Defines the amount of time the device remains charged if a shock has not been delivered. Applies to Manual Defibrillation and Sync modes only.	30 , 60, 90 sec

[Table 60](#) lists the AED mode settings.

Table 60 Configuration – AED

Parameter	Description	Setting Choices
Voice Prompts	Defines the level of detail in AED mode voice instructions.	Long, Short
NSA Action	Defines what the device does after a No Shock Advised (NSA) decision. NSA Monitor allows you to initiate background shock advisory analysis; NSA CPR instructs you to initiate a CPR Pause period, if needed.	NSA Monitor, NSA CPR
NSA Monitor Prompt Interval	Defines the interval for patient care prompts in NSA Monitor following a No Shock Advised decision.	1 min, 2 min, 3 min, Infinite (no prompts)
SpO2 Monitoring	Defines whether SpO ₂ monitoring is available in AED mode.	Enabled, Disabled
EtCO2 Monitoring	Defines whether EtCO ₂ monitoring is available in AED mode.	Enabled, Disabled

Table 60 **Configuration – AED (Continued)**

Parameter	Description	Setting Choices
Adult 1st Shock Energy Dose	Defines the energy dose for the first shock in a series in AED mode.	150, 170, 200
Adult 2nd Shock Energy Dose	Defines the energy dose for the second shock in a series in AED mode.	All energy settings $\geq$ the first configured shock in the series up to 200 J, 150
Adult 3rd Shock Energy Dose	Defines the energy dose for the third and subsequent shocks in a series in AED mode.	All energy settings $\geq$ the second configured shock in the series up to 200 J, 150
Alarms Off	Neither visual nor audio indications are enabled. In clinical modes, all alarm condition events that generate alarm signals shall be stored in the current Event record.	Enabled, Disabled
Shock Series	Defines the number of shocks in a shock series. Shock series is the number of preselected shocks (1-4) before the CPR pause period. After the CPR pause period, the shock series begins again.	1, 2, 3, 4
Shock Protocol Timeout	Defines the time interval that determines whether a shock is included as part of the shock series. The value “Infinite” means that a shock is included in the shock series per the Shock Series configured shocks, regardless of the time between shocks.	1 min , 2 min, Infinite

NOTE: In AED mode, the time to auto disarm is 30 seconds and not configurable.

Table 61 lists the pacer settings.

Table 61 **Configuration – Pacer**

Parameter	Description	Setting Choices
Default Pacer Rate	Defines the delivery rate of paced pulses. Adjusted in increments of 10.	30-180, 70 ppm
Pace Pulse Duration	Defines the paced pulse duration.	20, 40 msec
Default Pacer Output	Defines the pacer output default setting at which paced pulses are delivered.	If Pace Pulse Duration is 20 msec: 10-200, 30 mA If Pace Pulse Duration is 40 msec: 10-140, 30 mA

Table 62 lists the CPR settings. When the Q-CPR option is not enabled, then the only configurable item is CPR Time.

Table 62 **Configuration – CPR**

Parameter	Description	Setting Choices
Q-CPR	Turns the Q-CPR option On or Off.	On, Off
Q-CPR Feedback	Turns the Q-CPR feedback On or Off.	On, Off
Q-CPR Voice	Turns the Q-CPR voice instructions.	Audible, Muted
Compression-Only CPR	When enabled, turns off prompts for ventilation.	Enabled, Disabled
Compression Color	Defines the color of the Compression Counter.	Red, Yellow, Blue, Green, Cyan, Magenta, White
Ventilation Color	Defines the color of the Ventilation Counter.	Red, Yellow, Blue, Green, Cyan, Magenta, White
Research Storage	Defines whether the device stores the force, acceleration, and PCI wave data.	On, Off
CPR Time	Defines the length of the CPR administration interval.	1, 1.5, 2, 2.5, 3 min

Display Settings

The display settings customize the data that is displayed on the HeartStart Intrepid screen.

Table 63 **Configuration – Waves Settings**

Parameter	Description	Setting Choices
Wave 1	Selects the waveform displayed in the corresponding wave sector. NOTE: The default for wave sector 1 cannot be set to Paddles .	Pads, I, II, III, aVR, aVL, aVF, V
Wave 2		Pads/Paddles, I, II, III, aVR, aVL, aVF, V, Cascade, Annotated ECG, None
Wave 3		Pads/Paddles, I, II, III, aVR, aVL, aVF, V, CO2 (if the EtCO ₂ option is installed), None
Wave 4		Pads/Paddles, I, II, III, aVR, aVL, aVF, V, Pleth (if the SpO ₂ option is installed), None

Table 64 lists the mark events settings used to annotate the ECG strip and event summary. There is a 32-character limit when defining events.

Table 64 **Configuration – Mark Events**

Parameter	Description	Default Settings
Mark Event 1	Defines the corresponding event menu choice.	IV Access
Mark Event 2		Epinephrine
Mark Event 3		Amiodarone
Mark Event 4		Atropine
Mark Event 5		Morphine
Mark Event 6		Nitroglycerin
Mark Event 7		Aspirin
Mark Event 8		Other

Table 65 lists the printing settings used to define the information printed at certain moments and events.

Table 65 **Configuration – Printing**

Parameter	Description	Setting Choices
Print On Alarm	Defines the type of alarms that automatically print a strip.	High/Medium, High, None
Print On Charge	Defines if a continuous strip is printed when the device is charged.	Yes, No
Print On Shock	Defines if a continuous strip is printed when a shock is delivered or when a shock is attempted but not delivered.	Yes, No
Print On Mark	Defines if a continuous strip is printed when the Mark Event button is pressed.	Yes, No
Printer Delay	Defines whether printed strips include an additional 10 seconds of information which occurred just prior to initiating the print.	0 sec, 10 sec
Event Summary Report	Defines the information contained in an event summary. Short includes a log of events and vitals; Long adds waveforms.	Short, Long
Auto Print OpCheck Report	Defines if an operational check report is automatically printed upon the completion of an operational check.	Yes, No
Weekly Tests in AutoTest Summary	Provides a numerical value indicating the number of weekly tests in the AutoTest summary.	1-53, 53
Waveform Print Speed	The time scale at which the printer produces waveform printouts +/- 5%. Once configured, the print speed is applicable for any print mode.	25 mm/sec , 50 mm/sec

Data Management Settings

The data management settings customize the way your HeartStart Intrepid communicates with other healthcare devices and networks.

Table 66 lists the 12-Lead settings used to control the 12-Lead reports transmission and display.

Table 66 Configuration – 12-Lead

Parameter	Description	Setting Choices
Analysis	Identifies the analysis information included on the 12-Lead Report. None: prints waveforms, Event/patient ID, date and time. Measurements Only: adds HR, interval and axis measurements. Standard: adds severity, interpretive statements, and reasons.	None, Measurements Only, Standard
Critical Value Statements	Enables or disables the display, printing, and exporting of critical value statements.	Yes, No
ECG Bandwidth for 12-Lead Display	Identifies the default ECG bandwidth for the 12-Lead display.	0.15-40 Hz, 0.05-40 Hz , 0.05-150 Hz
ECG Bandwidth for 12-Lead Report	Identifies the default ECG bandwidth for printed and stored 12-Lead Reports.	Same as Display , 0.05-150 Hz
ECG Report	Identifies how the 12-Lead ECG segments are displayed for the 12-Lead Report. The segments are displayed in three rows, four columns for each row. Sequential: Each column represents a sequential 2.5-second period of time for a total of 10 seconds. Simultaneous: Each column represents the same 2.5-seconds of time.	Sequential, Simultaneous
Number of Automatic Printouts	Identifies the number of 12-Lead ECG Reports printed at the end of analysis.	0, 1, 2
Printer Format	Identifies the format of rhythm strips to be printed with the 12-Lead Report.	3x4, 3x4 1R , 3x4 3R
Rhythm Strip #1	Identifies the first rhythm strip printed in the 3x4 1R or 3x4 3R format.	I, II , III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6
Rhythm Strip #2	Identifies the second rhythm strip printed for reports in the 3x4 3R format.	I, II, III, aVR, aVL, aVF , V1, V2, V3, V4, V5, V6
Rhythm Strip #3	Identifies the third rhythm strip printed for reports in the 3x4 3R format.	I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5 , V6
DXL Sensitivity	Standard : standard DXL algorithm AMI sensitivity setting. This is the default setting. EMS : decreases AMI sensitivity in the presence of other possible causes of ST elevation that can mimic AMI, such as Bundle Branch Blocks.	Standard , EMS

Wi-Fi Configuration

Table 67 lists Wi-Fi parameters. Security can be one of two groups: personal (used in small businesses and homes) or enterprise (used in large businesses). Available parameters depend on the security type selected. Not all settings in Table 67 are required. Check with your Wi-Fi network administrator.

Table 67 Configuration – Wi-Fi

Parameter	Description	Setting Choices
SSID	Network name (example: WLAN-ABC)	32 characters, blank
Security	Defines the method of security to protect the wireless connection to the Wi-Fi access point.	blank Personal parameters: Off, WEP, WPA_TKIP_PSK, WPA_AES_PSK, WPA2_TKIP_PSK, WPA2_AES_PSK. Enterprise parameters: WPA_TKIP_ENT, WPA_AES_ENT, WPA2_TKIP_ENT, WPA2_AES_ENT All four enterprise security types require the choice of an EAP type. The EAP types are: • PEAP-MSCHAP: UserName, Password, CA Certificate • EAP-TTLS: UserName, Password, CA Certificate • EAP-TLS: UserName, Client Certificate, Client Certificate Password, CA Certificate
Key Index	Key index available in WEP	1, 2, 3, 4
EAP Type	Extensible Authentication Protocol type. Available in enterprise security.	PEAP-MSCHAP,EAP-TTLS,EAP-TLS
Key	Pre-Shared key. Available in personal security.	64 characters
UserName	User name for authentication. Available with EAP types PEAP-MSCHAP, EAP-TTLS, EAP-TLS	64 characters
Password	Password for authentication. Available with EAP types PEAP-MSCHAP, EAP-TTLS	64 characters
Client Certificate	User certificate to authenticate client in server side. Available with EAP type EAP-TLS	Imported in certificate management page

Table 67 **Configuration – Wi-Fi (Continued)**

Parameter	Description	Setting Choices
Client Certificate Password	The password for the user certificate file. Available with EAP type EAP-TLS	64 characters
CA Certificate	Authenticates radius server in client side. Available with EAP types PEAP-MSCHAP, EAP-TTLS, EAP-TLS	Imported in certificate management page
Domain	Reserved	Reserved

Cellular Configuration

Contact your cellular mobile network provider to obtain the correct Access Point Name (APN) for the APN field in [Table 68](#).

Table 68 **Configuration – Cellular**

Parameter	Description	Setting Choices
Connection name	User-defined string to identify the mobile network operator (e.g., T-Mobile, Vodafone, Orange)	blank
Login Username	User name for the authentication phase.	32 characters
Login Password	Password for the authentication phase.	64 characters
APN string	Access Point Name, such as apn.provider.com	32 characters

Certificate Management Configuration

The HeartStart Intrepid Monitor/Defibrillator uses a certificate to securely connect to Philips Emergency Care Informatics Suite. For information about certificate parameters, see [Table 69 “Configuration – Certificate Management”](#).

Table 69 **Configuration – Certificate Management**

Parameter	Description
Available Wi-Fi CA Certificate	Identifies the available Wi-Fi certificate authority (CA) certificate.
Available Wi-Fi Client Certificate	Identifies the available Wi-Fi client certificate.

Table 69 Configuration – Certificate Management (*Continued*)

Parameter	Description
Import Wi-Fi CA Certificate	Identifies the available certificate authority (CA) certificate. The file has the extension “.cer”.
Import Wi-Fi Client Certificate	Identifies the client certificate Wi-Fi connection. The file has the extension “.pfx”.
Import Server CA Certificate	Identifies the available certificate authority (CA) certificate that authenticates the connection to the Philips Emergency Care Informatics Suite server. This field is pre-configured. The file is IntrepidRootCA and may have the extension .pem or .cer.

Importing Certificate Information to the HeartStart Intrepid

To ensure that the HeartStart Intrepid has current certificate information, you may need to export certificate information from the login page of Philips Emergency Care Informatics Suite and import it to the HeartStart Intrepid:

- Work with your Emergency Care Informatics Suite administrator to save the certificate information to a Philips-approved USB data drive (part number 989803202611). The certificate file must be saved to the root of the USB data drive (not within a folder) and be the only file saved to the USB data drive.
- You do not need to be an Emergency Care Informatics Suite user to export the certificate information.

The Configuration password for the HeartStart Intrepid is required to import certificate information. Philips recommends that the person responsible for configuring the HeartStart Intrepid import the certificate information from the Philips-approved USB data drive to the HeartStart Intrepid. After importing the certificate information, test the communication with Philips Emergency Care Informatics Suite by transmitting an event.

☉ To import certificate information to the HeartStart Intrepid:

- 1 With the HeartStart Intrepid turned off, insert the USB data drive containing the certificate file into the USB port of the HeartStart Intrepid.
- 2 On the HeartStart Intrepid, turn the Therapy knob to **Monitor**.
- 3 Press the Smart Select knob. The **Main menu** appears.
- 4 In the **Main menu**, select **Other** and press the Smart Select knob.
- 5 Select **Configuration** and press the Smart Select knob.
- 6 In the prompt, select **Yes** and press the Smart Select knob to exit clinical mode and view the Configuration screen.
- 7 Press the Smart Select knob. The Configuration menu appears.
- 8 In the Configuration menu, select **Certificate Management** and press the Smart Select knob.
- 9 Select **Server CA Certificate** and press the Smart Select knob.
If the certificate file on the USB data drive is detected, the file name automatically appears in the bottom right corner of the screen.
- 10 Use the Smart Select knob to select the certificate and press the Smart Select knob.
- 11 Press the **[Import]** soft key.

- 12 Enter the configuration password to complete the import.
- 13 To test the connection to Philips Emergency Care Informatics Suite, enter Data Management mode on the HeartStart Intrepid and transmit an event.
For more information, see “[Transmitting Event Data in Data Management Mode](#)” on page 183.

Communication Configuration

Table 70 lists the communication destinations for data that is sent to Philips Emergency Care Informatics Suite.

Table 70 **Configuration – Communication**

Parameter	Description	Setting Choices
Reference ID	Free field that can be used to identify the HeartStart Intrepid device that is sending the information.	up to 32 characters, blank
Cloud URL	Contains the URL of the Philips Emergency Care Informatics Suite server. The URL varies depending on your country and location. Obtain the correct URL from your Philips representative.	up to 32 characters, blank
Account ID	Contains the six-character Philips Emergency Care Informatics Suite account ID.	6 characters
Destination 1-32	Contains the name of the hospital or medical facility that has access to the data that is sent from the HeartStart Intrepid. The destination must be enabled in order for the HeartStart Intrepid to send data to that location. The Destination field is not required. If no destination is specified, the data is available in Philips Emergency Care Informatics Suite to only the HeartStart Intrepid device owner.	10 alpha-numeric characters including period, slash, hyphen and space, blank Enabled , Disabled

Table 71 **Configuration – Change DataMgmt Password**

Parameter	Description	Setting Choices
New Password	8-24 characters	at least eight characters, blank
Password	8-24 characters	at least eight characters, blank
Configuration Password	8-24 character configuration password, required to set the data management password	at least eight characters, blank

NOTE: It is recommended to write down the Data Management password and store it in a secure location. Refer to the insert that shipped with your device for default password information for Configuration and Service modes.

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no vertical margin lines or other markings present.

Data Management

This chapter describes the data management features of the HeartStart Intrepid, including transmitting and printing data, Trends Reports (available in Monitor mode), and event summary.

This chapter is divided into the following sections:

	Overview	p. 179
	Accessing Data Management Functions	p. 180
	Vital Signs Trends Data	p. 184
	Network Connection and Sending Data	p. 186
	Troubleshooting	p. 187
	Events Stored in an Event Summary	p. 187

Overview

Data Management mode is a non-clinical mode used to perform the following functions:

- View and manage event summaries, including printing, exporting, and transmitting event summaries.
- Remove patient-identifying information from event summaries.
- Manage event summaries on a connected USB drive.

Event Summaries

The HeartStart Intrepid automatically generates an event summary for each patient event. Each event summary is assigned a unique event identification number, date and time stamped, and stored in the device's internal memory. Data related to the current event is available for viewing, reporting, transmitting, and printing. Vital sign parameters are part of the event summary, including trends data.

A event summary is initiated when one of the following occurs:

- A valid ECG signal is acquired.
- Valid SpO₂ data is acquired.
- Valid CO₂ data is acquired.
- Valid NBP data is acquired.
- A valid CPR compression is detected.
- The Charge button is pressed.
- The Mark Event button is pressed.

An event summary ends when the device is turned off or enters a non-clinical mode.

Data Collected During an Event Summary

The HeartStart Intrepid can be configured to save short or long event summaries. Long event summaries contain all of the following information. Short event summaries exclude waveform information.

Patient data collected, if available, includes:

- Two ECG waveforms with beat labels
- One pleth waveform
- One CO₂ waveform
- Patient event information including:
 - Patient name, sex, category, ID
 - Parameter information / Trends data
 - Physiological alarms and alarm limits
 - Defibrillation and pacing events
 - Mark events
- Technical/device event information including:
 - Power on/off
 - Technical alarms
 - Initial mode and mode changes
 - Initial battery status and subsequent changes
 - Print Strip
- Research data, including waves (AED mode only) and shock / no shock decisions

Event Summary Retention

The HeartStart Intrepid has an 8-hour data limit per incident for an event summary. The number of event summaries that can be stored is related to the duration of each individual event summary. For example, the HeartStart Intrepid can store approximately 80 event summaries of approximately 30 minutes in length or 5 event summaries of approximately 8 hours in length:

- If the 8-hour limit is reached for an event summary, the HeartStart Intrepid stops recording, and a message is displayed on the HeartStart Intrepid.
- When the internal memory is full, the oldest event summary is automatically deleted to store the new event summary.

Accessing Data Management Functions

When you first access Data Management mode, the **Data Management - Internal Memory** screen appears and provides the following event information:

- **ID** – Indicates whether the event data record contains patient information that could uniquely identify the individual. **Y** indicates that identifiable patient information is present.
- **Date and Time** – Date and time the event began.
- **Elapsed** – Duration of the event.
- **Paced** – Total paced time for the event.
- **Event ID** – The unique ID for the event.
- **Shocks** – Total number of shocks delivered during the event.

- **Event Storage Used / Free** – The amount of space used/available in internal memory.
- **Number of Events Stored** – The number of events that are currently stored in internal memory.

WARNING: Do not access Data Management mode while monitoring a patient.

☉ To access **Data Management mode**:

- 1 Turn the Therapy knob to Monitor, Pacer, or Manual Defib.
- 2 Press the Smart Select knob. The **Main Menu** appears.
- 3 In the **Main Menu**, select **Other** and press the Smart Select knob. The **Other** menu appears.
- 4 In the **Other** menu, select **Data Management** and press the Smart Select knob.
- 5 When prompted to exit clinical mode, select **Yes** and press the Smart Select knob. The **Data Management - Internal Memory** screen appears.

NOTE: The more data in memory, the longer the list takes to populate.

- 6 Press the Smart Select knob. The **Data Management** menu appears.
- 7 In the **Data Management** menu, turn and press the Smart Select knob to highlight and select the function you want:
 - **Print.** Prints the currently selected event summary. For more information, see [“Printing an Event Summary Report”](#) on page 181.
 - **Export.** Exports the currently selected event summary to the inserted USB drive. For more information, see [“Accessing Event Summary Data on the USB Drive”](#) on page 182.
 - **Export All.** Exports all event summaries to the inserted USB drive. For more information, see [“Accessing Event Summary Data on the USB Drive”](#) on page 182.
 - **Transmit Event.** Transmits event data to the location configured for the device. For more information, see [“Transmitting Event Data in Data Management Mode”](#) on page 183.
 - **Remove All Patient Info.** Removes identifying information from all Event Summaries stored in the device. For more information, see [“Removing All Identifying Patient Data”](#) on page 183.
 - **View USB Drive.** Views and manage event summaries on the inserted USB drive. For more information, see [“Accessing Event Summary Data on the USB Drive”](#) on page 182.
 - **Switch to Cellular.** Switches from Wi-Fi mode to Cellular mode. For general information about network connection, see [“Network Connection and Sending Data”](#) on page 186.
 - **AP list.** Views a list of applications.

Printing an Event Summary Report

You can print an event summary report during a patient event or from Data Management mode after the event has ended.

NOTE: If the printer runs out of paper while printing an event summary, the event summary resumes printing if a new roll of paper is installed within 3.5 minutes.

Three waves can be included when printing an event summary:

- First printed wave is always the primary ECG.
- Second and third printed waves are whatever the parameter is being displayed in Wave 2 and Wave 3 on the device screen.

Note the following printer behavior:

- If you change from a clinical mode to non-clinical mode during printing, the HeartStart Intrepid asks if you want to stop printing.
- If you have manually started printing a strip and the HeartStart Intrepid tries to automatically initiate a strip, the automated print strip is ignored.
- If the HeartStart Intrepid automatically initiates a print strip and then automatically initiates another print strip, the first strip is extended to include data through the end time of the second strip.
- If you request to print a report while the printer is currently printing another report, the HeartStart Intrepid prompts you with questions. Your answers determine the print priority.

⊙ To print an event summary stored in internal memory:

- 1 Access the **Data Management - Internal Memory** screen.
- 2 Select the event summary you want to print and press the Smart Select knob. The **Data Management** menu appears.
- 3 In the **Data Management** menu, select **Print**. The **Print** menu appears.
- 4 In the **Print** menu, select **Event Summary** and press the Smart Select knob to begin printing.

Accessing Event Summary Data on the USB Drive

A compatible USB drive must be inserted into the HeartStart Intrepid to view and manage event summaries on the USB drive. Data on the USB drive can be downloaded to a computer and viewed with a data management software application.

Exporting Data to the USB Drive

Data can be exported (saved) to a USB drive from Data Management mode, Configuration mode, and after an operational check. You can export a single event summary or all event summaries from the HeartStart Intrepid to the inserted USB drive.

Note the following:

- If you change from Data Management mode to a clinical mode while data is exporting, an alert appears indicating that data export is in process and includes the prompt **Stop Exporting?**. Select **Yes** to stop the export and continue to the new mode. Select **No** to continue exporting data.
- If you turn the device off while exporting data, the export is stopped and the exported data may be incomplete.

⊙ To export a single event summary data to an approved USB drive:

- 1 Access the **Data Management - Internal Memory** screen.
- 2 Select the event summary you want to export and press the Smart Select knob. The **Data Management** menu appears.
- 3 In the **Data Management** menu, select **Export** and press the Smart Select knob:
 - Depending on your device configuration, you may be prompted to remove all patient-related data prior to exporting.
 - A message appears warning you to not remove the USB drive and disappears when the export is complete.

⊙ To export all event summaries to an approved USB drive:

- 1 Access the **Data Management - Internal Memory** screen.

- 2 Press the Smart Select knob. The **Data Management** menu appears.
- 3 In the **Data Management** menu, select **Export All** and press the Smart Select knob. A message appears warning you to not remove the USB drive and disappears when the export is complete.
- 4 To cancel an export in progress, select **Cancel Export**.

Managing Event Summaries on the USB Drive

You can view event summaries stored on the USB drive. You can also delete all event summaries from the USB drive.

- ⦿ To manage event summaries on the USB drive:
 - 1 Access the **Data Management - Internal Memory** screen.
 - 2 Press the Smart Select knob. The **Data Management** menu appears.
 - 3 In the **Data Management** menu, select **View USB Drive** and press the Smart Select knob. The **Data Management - USB Drive** screen appears.
 - 4 If you want to delete all event summaries from the USB drive:
 - a Press the Smart Select knob. The **Data Management** menu appears.
 - b In the **Data Management** menu, select **Erase Drive** and press the Smart Select knob to erase all event summaries from the USB drive.
 - c In the confirmation prompt, select **Yes** to erase all data on the USB drive.
 - 5 To return to the **Data Management - Internal Memory** screen:
 - a Press the Smart Select knob. The **Data Management** menu appears.
 - b In the **Data Management** menu, select **View Internal Memory** and press the Smart Select knob.

Transmitting Event Data in Data Management Mode

- ⦿ To send an event summary from Data Management mode, post-event:
 - 1 Access the **Data Management - Internal Memory** screen.
 - 2 Select the event summary you want to transmit and press the Smart Select knob. The **Data Management** menu appears.
 - 3 In the **Data Management** menu, select **Transmit Event** and press the Smart Select knob. A message with the transmission result appears.
 - 4 Press the Smart Select knob to close the message window.

Removing All Identifying Patient Data

All HeartStart Intrepid users are responsible for protecting the use, disclosure, and exchange of electronic Protected Health Information (ePHI). Patient-related data includes name, medical record number, age, and other information that could uniquely identify an individual. In Data Management mode, you can de-identify patient event summaries in two ways:

- When exporting event summaries, the HeartStart Intrepid can be configured to prompt whether to remove all patient-related data prior to exporting. If this function is enabled, the HeartStart Intrepid prompts whether to **Export Without Patient Info**. Select **Yes** to remove the patient-identifying related data prior to exporting or **No** to export with patient-identifying related data in the event summary.

- When the Internal Memory Menu is displayed, selecting **Remove All Patient Info** prompts the HeartStart Intrepid to ask whether to **Remove Patient Info from All Internal Event Data?** Select **Yes** to remove the patient-identifying related data or **No** to keep the patient-identifying related data in the event summary.

NOTE: This removes patient-identifying data from all records in the memory.

Printing During a Patient Event

To print a strip during an event, press the Print button .

The HeartStart Intrepid allows you to print various reports in a clinical mode during a patient event. The printed strip contains the header information, configured waveforms, wave markings (R-Wave Arrows, Pacing Markers), and events, including event markers.

The HeartStart Intrepid can also be configured to print a strip when an alarm, charge, shock, or mark event occurs. See [Table 65 “Configuration – Printing”](#) on page 172.

Table 72 Event Markers

Event	Symbol
Mark Events	
Physiological Alarm	
Shock Delivered	

Vital Signs Trends Data

In Monitor mode, you can view numeric vital signs trends data in the lower two wave sectors. Trends data can be displayed at selected intervals for up to 8 hours of monitoring. The trend interval can be set to 1, 5, 10, 15, 30, or 60 minutes. You can also print trends data associated with an event summary.

For an example of trends data, see [Figure 69](#). Note the following data aspects and display behavior:

- The parameters being measured are listed in the left column:
 - Parameters are listed in the following order: heart rate (HR), SpO₂, pulse, EtCO₂, AwRR, NBP, and temperature.
 - For data that is continuously measured (such as heart rate, EtCO₂, SpO₂, temperature, and pulse), the value is the average of the measurements taken during the trend interval.
 - NBP measurements include a time stamp. If more than one valid NBP measurement is taken during the trend interval, the systolic, diastolic, mean, and time stamp of the latest valid measurement are displayed with a “^”.
- The most recent trend interval and its data appears in the far right column, which replaces the older trend interval data on the display. The units of measure for trend data are not shown.
- If a parameter has invalid information, a -?- is displayed. Questionable data is indicated by a question mark just before the numeric value. Unavailable data is indicated by a blank space.

Figure 69 Display of Trends Data

Jan 25	11:05	11:10	11:15	11:20	11:25	11:30	11:35	11:40	11:45	11:50	11:55
HR	99	111	118	103	109	98	99	111	118	103	109
SpO2	97	98	99	100	97	98	99	100	97	98	99
Pulse	94	106	113	98	104	93	94	106	113	98	104
EtCO2	-?-	-?-	-?-	-?-	-?-	-?-	-?-	-?-	-?-	-?-	-?-
AwRR	15	16	17	18	15	16	17	18	15	16	17
NBPs	123			132			128			124	
NBPd	80			84			83			79	
NBPm	96			98			97			96	
	11:03			11:18^			11:32			11:47	
Temp	98.7	98.6	98.7	98.6	98.4	98.7	98.5	98.4	98.5	98.2	98.3

Viewing Trends Data

In Monitor mode, you can view and print trends data.

☉ To view trends data:

- 1 In Monitor mode, press the Smart Select knob. The **Main Menu** appears.
- 2 In the **Main Menu**, select **Trends**, and press the Smart Select knob. Trends data is shown in the bottom two wave sectors.
- 3 To navigate the trends data:
 - Use the horizontal arrow soft keys to move through the displayed trends data. The soft key is inactive (grayed out) if there is no more data to be viewed in that direction.
 - If a menu is open, exit the menu to navigate the trends data again.
- 4 To print the trends data accumulated so far, do the following:
 - a Press the **[Print Trends]** soft key. The **Trend Interval** menu appears.
 - b In the **Trend Interval** menu, select the interval and press the Smart Select knob to begin printing.
- 5 To close the trends display, press the **[Close Trends]** soft key.

Setting Trend Intervals

Trends data can be displayed for a selected trend interval for up to 8 hours of monitoring. Upon first use of the device, the trend interval is set to 5 minutes.

The trend interval can be set to 1, 5, 10, 15, 30, or 60 minutes. The trend interval is retained for future trend data until changed.

☉ To change the trend interval:

- 1 While viewing trends data, press the Smart Select knob. The **Main Menu** appears.
- 2 In the **Main Menu**, select **Trend Interval**, and press the Smart Select knob. The **Trend Interval** menu appears.
- 3 In the **Trend Interval** menu, select the interval and press the Smart Select knob. The trend interval is retained for future trend data until changed again.

Printing Trends Data from an Event Summary

- ◎ To print trends data associated with an event summary saved in internal memory:
 - 1 Access the **Data Management - Internal Memory** screen.
 - 2 Select the event summary containing the trends data you want to print and press the Smart Select knob. The **Data Management** menu appears.
 - 3 In the **Data Management** menu, select **Print** and press the Smart Select knob. The **Print** menu appears.
 - 4 In the **Print** menu, select **Trends** and press the Smart Select knob. The **Trend Interval** menu appears.
 - 5 In the **Trend Interval** menu, select the interval and press the Smart Select knob to begin printing.

Network Connection and Sending Data

You can connect the HeartStart Intrepid to a Wi-Fi network or use the Wireless Communication Module with the HeartStart Intrepid to connect to a cellular network. Your connection method does not affect the steps to send data from the HeartStart Intrepid.

When connected to a network, you can send the following data to a Philips data solution compatible with the HeartStart Intrepid:

- During an event, you can send 12-lead ECG and vitals data.
- After an event, you can send event summaries.

To connect to a Wi-Fi or cellular network, you must configure the HeartStart Intrepid. For configuration information, see the applicable sections in [Chapter 14 “Configuration”](#) on page 159. For information about the Wireless Communication Module, see the *Wireless Communication Module Instructions for Use*.

WARNINGS: Ensure that the HeartStart Intrepid is off before connecting and disconnecting the Wireless Communication Module. Failure to do so may prevent the HeartStart Intrepid from functioning properly.

Network changes, other equipment on the same network, weather, geography, loose connection of the Wireless Communication Module, and other factors may interfere with connection and data transfer. Ensure you have contingency plans should network connection and data transfer fail.

Network Connection Considerations

You and your organization must determine the risks when connecting the HeartStart Intrepid to a network:

- Successful connection and data transfer depends on the availability of Wi-Fi or cellular networks. Data transfer uses TLS 1.2 encryption and closed network ports when connecting to a Philips data solution, such as Emergency Care Informatics Suite.
- If the transmission process is compromised, potential risks may be introduced and affect patients, operators, and third parties. If you suspect that a cybersecurity incident has occurred or a vulnerability is present, contact Philips for service.

Sending 12-Lead Data from 12-Lead Mode During an Event

- ☉ To send the current 12-Lead data from 12-Lead mode during an event:
 - 1 In 12-Lead mode, press the [Start Acquire] soft key.
 - 2 When the 12-lead acquisition is complete, press the [Send] soft key.
If the device has been configured with a destination list, the list is displayed.
 - 3 Choose the destination for the 12-lead report, and then press the Smart Select knob to begin sending.
 - 4 If multiple 12-lead reports have been taken during the event, choose a report to send.
A transmission status message appears.
 - 5 Press [OK] to close the window.

Sending Vitals Data From a Clinical Mode During an Event

- ☉ To send vitals data from clinical mode during an event:
 - 1 In Monitor mode, press the Smart Select knob.
The **Main Menu** appears.
 - 2 Press the Smart Select knob.
 - 3 In the **Main Menu**, select **Transmit Vitals** and press the Smart Select knob to begin sending the data:
 - If the device has been configured with a destination list, the list is displayed. Choose the destination, and then press the Smart Select knob to begin sending the data.
 - A transmission status message appears. Press the Smart Select knob to acknowledge and close the message.

Troubleshooting

If your HeartStart Intrepid does not operate as expected during data management, see “[Troubleshooting](#)” on page 227.

Events Stored in an Event Summary

Events and wave segments can be stored in an event summary. Tables 73 – 86 list events and related information stored in an event summary. Not all events listed might be possible, based on the device’s configuration. Text in parentheses is replaced by an appropriate value that includes the parameter’s unit of measurement.

To have waves stored in the event summary, the HeartStart Intrepid must be configured for long event summaries. See [Table 65](#) on page 172. Segments include a header, waveform, and events.

NOTE: If a Daylight Savings Time change occurs during an event, the time stamps for that event are not adjusted. The next event summary uses the adjusted time.

Power-Related Events

Table 73 **Power-Related Event Information**

Logged Event	Cause of the Event
Device On	Device first turns on.
Continued Use	Device is turned on after being turned off for less than 10 seconds.
Device Off	The Therapy Knob is turned to the Off position.
Autotest Failure	A critical device failure has been reported.
!!!Equipment Disabled: System Failure	Any out-of-range voltages are detected.
!!System Failure. Service Required	The device determines that one or more subsystems is not functioning properly.
!!!Autotest Error. Run Op Check	The device cannot determine when the last autotest was run.
Autotest Overdue: Run OpCheck	Power was not available (for a week or longer) to run a scheduled autotest.
Power Test Failure	During RFU testing if the battery cannot sufficiently charge the device.

Patient and Mode Change Events

Table 74 **Patient, Mode, and Energy Position Information**

Logged Event	Cause of the Event
Adult or Infant/Child	Patient category is set or changed.
Paced, Non-Paced, Pacing Status Unknown	Internal paced status is set or changed. Paced status indicates whether the patient has an internal pacemaker.
AED Mode	At the start of an event and when mode or selected energy changes.
Monitor Mode	
Pacer Mode	
Defib Mode	
Sync activated	
Defib energy in joules J)	
Exit Clinical Mode	Exiting a clinical mode.

Battery Status Change Events

Table 75 **Battery Status Information**

Logged Event	Cause of the Event
Low Battery	Battery is low.
Pacing on Low Battery	Pacing while the battery is low.
Shutting Down in 1 min	Imminent shutdown warning is issued.

Table 75 **Battery Status Information (Continued)**

Logged Event	Cause of the Event
Shutting Down Now	Shutdown warning is issued.
Battery Charge Good	The battery charge level is good.
Battery Not Present	The battery is not present.
Battery Communication Failure	Communication with the battery has failed.
Replace Battery	The battery has reached its end of life.

Pads / Paddles / Leads EventsTable 76 **Pads / Paddles / Leads and Vitals Information**

Logged Event	Cause of the Event
Pads On	Pads are applied to the patient.
Pads Off	After a Pads On event if the multifunction electrode pads are removed from the patient or the Therapy cable is disconnected.
Pads Shorted	A pad impedance is low.
Pads Marginal	Poor pads contact, high pad impedance.
External Paddles On	External paddles make contact with the patient.
External Paddles Off	After External Paddles On if paddles lose contact with the patient.
Internal Paddles On	Internal paddles make contact with the patient.
Internal Paddles Off	After Internal Paddles On if paddles lose contact with the patient.
Leads On	Monitoring electrodes for primary ECG are attached to the patient.
Leads Off	After Leads On if a monitoring electrode for the primary wave loses contact with the patient.
HR (value), SpO2 (value), EtCO2 (value), AwRR (value), Pulse (value), NBP (value)	A measurement is recorded.

HR / ECG and Pacing EventsTable 77 **HR / ECG Event Information**

Logged Event	Cause of the Event
***Asystole	A high priority latching physiological alarm is generated.
***V-Fib/Tach	
***V-Tach	
Extreme Brady (value) < (limit)	
Extreme Tachy (value) > (limit)	

Table 77 **HR / ECG Event Information (Continued)**

Logged Event	Cause of the Event
**Pacer Not Capture	In Pacer mode, a medium priority latching physiological alarm is generated.
**Pacer Not Pace	
**PVC (value) > (limit)/min	A medium priority non-latching physiological alarm is generated.
HR High (value) > (limit)	
HR Low (value) < (limit)	
Cannot Analyze ECG	ECG data that cannot be analyzed.
ECG Equipment Malfunction	ECG equipment malfunction.
Pads ECG Equipment Malfunction	ECG pads (or paddles) equipment malfunction.
ECG Alarms On / ECG Alarms Off	ECG alarms are turned off or on and any subsequent change.
HR Limits (low) (high)	HR alarms are turned on and when there is a change in alarm limits.
VTACH Limits HR (limit) bpm Run (limit)	VTACH alarms are turned on and when there is a change in alarm limits.
PVC/min Limit (limit)	PVC rate alarms are turned on and when there is a change in alarm limits.
Learning ECG	The HeartStart Intrepid is evaluating the ECG signal.
Learning Rhythm	The HeartStart Intrepid is evaluating the ECG rhythm.
ECG Bandwidth for Display , for Printing (with settings)	Initial ECG bandwidth for display, printing, and storage are logged.
Therapy Disabled: Run Op Check	The device detects a therapy equipment failure.

Oximetry and Pulse Events

Table 78 **SpO₂ and Pulse Event Information**

Logged Event	Cause of the Event
SpO2 On / SpO2 Off	SpO ₂ monitoring is connected and any subsequent disconnect/connect.
**SpO2 High (value) > (limit)	The patient's SpO ₂ value is higher than the configured limit.
**SpO2 Low (value) < (limit)	The patient's SpO ₂ value is lower than the configured limit.
***Desat (value) < (limit)	The patient's Desat value is lower than the configured limit.
SpO2 Sensor Malfunction	The device is on and unable to acquire a Pleth waveform.
SpO2 Unplugged	SpO ₂ monitoring is on, and the sensor is disconnected.
SpO2 Noisy Signal	SpO ₂ is on and a noisy signal is detected.
SpO2 Interference	SpO ₂ is on and light interference is detected at the SpO ₂ sensor.
SpO2 Non-Pulsatile	SpO ₂ is on and a non-pulsatile SpO ₂ sensor signal is detected.
SpO2 Equipment Malfunction	SpO ₂ is on and an SpO ₂ equipment malfunction is detected.
SpO2 Erratic	SpO ₂ is on and an erratic measurement condition occurs.

Table 78 **SpO₂ and Pulse Event Information (Continued)**

Logged Event	Cause of the Event
SpO ₂ Extended Update	SpO ₂ is on and the measurement update period exceeds 30 seconds.
SpO ₂ Low Perfusion	SpO ₂ is on and low perfusion occurs.
SpO ₂ Error	A non-critical SpO ₂ error is detected.
SpO ₂ Alarms On/SpO ₂ Alarms Off	SpO ₂ alarms are turned on or off and any subsequent change.
SpO ₂ Limits (low) (high) Desat (limit)	SpO ₂ alarms are turned on and when there is a change in alarm limits.
**Pulse High (value) > (limit)	The patient's pulse is higher than the configured limit.
**Pulse Low (value) < (limit)	The patient's pulse is lower than the configured limit.
Pulse Alarms On / Pulse Alarms Off	Pulse alarms are turned on or off and any subsequent change.
Pulse Limits (low limit) (high limit)	Pulse alarms are turned on and when there is a change in alarm limits.

Capnography and Respiration Events

Table 79 **EtCO₂ and AwRR Event Information**

Logged Event	Cause of the Event
EtCO ₂ On / EtCO ₂ Off	EtCO ₂ monitoring is connected and any subsequent disconnect/connect.
**EtCO ₂ High (value) > (limit)	The patient's EtCO ₂ value is higher than the configured limit.
**EtCO ₂ Low (value) < (limit)	The patient's EtCO ₂ value is lower than the configured limit.
CO ₂ Sensor Warming Up	The CO ₂ sensor has not warmed up to operating temperature range.
CO ₂ Tube Unplugged	The CO ₂ sensor is unplugged or the filter line is disconnected.
CO ₂ Sensor Unplugged	The CO ₂ sensor is unplugged.
EtCO ₂ Alarms On / EtCO ₂ Alarms Off	CO ₂ alarms are turned on or off and any subsequent change.
EtCO ₂ Limits (low value) (high value)	CO ₂ alarms are turned on and when there is a change in alarm limits.
CO ₂ Zero In Progress	The sensor is zeroing.
CO ₂ Zero Required	The sensor needs to be zeroed.
CO ₂ Zero Complete	The sensor zeroing is complete.
CO ₂ Zero Failed - (reason)	The sensor zeroing failed.
CO ₂ Service Required	The CO ₂ sensor needs servicing.
CO ₂ Check Line	The CO ₂ sensor detects a kinked or blocked filter line.
CO ₂ Sensor Over Temp	The CO ₂ sensor detects that it is overheated.
CO ₂ Out of Range	The CO ₂ sensor detects its result is out of range.
CO ₂ Error	A non-critical EtCO ₂ error is detected.

Table 79 **EtCO₂ and AwRR Event Information**

Logged Event	Cause of the Event
CO2 Communication Failure	The HeartStart Intrepid cannot communicate with the CO ₂ sensor.
AwRR Alarms On / AwRR Alarms Off	AwRR alarms are turned on or off and any subsequent change.
AwRR Limits (low value) (high value)	AwRR alarms are turned on and when there is a change in alarm limits.
**AwRR High (value) > (limit)	The patient's AwRR value is higher than the configured limit.
**AwRR Low (value) < (limit)	The patient's AwRR value is lower than the configured limit.
***Apnea > (limit)	The Apnea alarm is displayed.
Apnea Time (time)	Apnea alarm limit setting is changed.

Blood Pressure and Temperature Measurement Events

Table 80 **NBP and Temperature Event Information**

Logged Event	Cause of the Event
NBP On Manual	A manual NBP measurement is requested.
NBP On (frequency value)	An automatic NBP measurement is requested (including frequency value).
NBP Frequency Manual	An automatic NBP measurement is changed to manual (including frequency value).
NBP Frequency (frequency)	The NBP frequency is changed.
NBP Alarms On / NBP Alarms Off	NBP alarms are turned on or off and any subsequent change.
NBP Limits Systolic (low, high value)	The Systolic NBP alarm limit is changed.
NBP Limits Diastolic (low, high value)	The Diastolic NBP alarm limit is changed.
NBP Limits Mean (low, high value)	The Mean NBP alarm limit is changed.
**NBPs High (value) > (limit)	The patient's Systolic NBP is higher than the configured limit.
**NBPs Low (value) < (limit)	The patient's Systolic NBP is lower than the configured limit.
**NBPd High (value) > (limit)	The patient's Diastolic NBP is higher than the configured limit.
**NBPd Low (value) < (limit)	The patient's Diastolic NBP is lower than the configured limit.
**NBPm High (value) > (limit)	The patient's Mean NBP is higher than the configured limit.
**NBPm Low (value) < (limit)	The patient's Mean NBP is lower than the configured limit.
NBP Cuff Not Deflated	The NBP cuff fails to deflate after 3 minutes.
NBP Cuff Overpressure	The NBP cuff pressure reaches 270 mmHg (40 kPa).
NBP Measurement Failed	An NBP measurement fails to complete.
NBP Error	The device detects a non-critical NBP failure.
NBP Equipment Malfunction	The NBP module detects a malfunction.
**Temp High (value) > (limit)	The patient's temperature is higher than the configured limits

Table 80 **NBP and Temperature Event Information (Continued)**

Logged Event	Cause of the Event
**Temp Low (value) < (limit)	The patient's temperature is lower than the configured limits
Temperature On / Off	Device is turned on and the probe is connected, and On / Off when the probe is connected/disconnected.
Temperature Limits (low, high value)	On event if temperature alarms are on, when settings are changed, or when the Temperature alarms are turned on.
Temp Alarms Off	The temperature alarms are turned off.

Defibrillation Events

Table 81 **Defibrillation Event Information**

Logged Event	Cause of the Event
Charging to (value) J	Charging is initiated.
Disarm Manual	The device is disarmed manually.
Disarm Auto - (reason)	The device disarms automatically. Reasons include: Pads Off: Logged when the automatic disarm is caused by a bad connection between the device and the patient. Shock Equipment Malfunction: Logged when the device is unable to reach the selected energy during charging. Timeout: Logged when the device reaches its configured auto-disarm period. No Shock Advised: Logged when, in AED mode, the algorithm determines the rhythm is not shockable. Device Off: Logged when the device is turned off while charged. Leads Off: Logged in Synchronized Cardioversion mode when a leads off condition is detected in the synchronizing lead. Pads/Paddle Type Unknown: Logged when, with the therapy cable connected, the device detects a change in the paddles or pads type or if the therapy cable type identification is not valid.
Shock # (number) (energy) J (impedance) (peak current) A	A shock is delivered.
Shock Aborted (impedance)	A shock is initiated but aborted before a full shock dose is delivered.
Sync On / Sync Off	Sync is turned on or off and any subsequent change.
Abnormal Shock Dose Delivered	A shock is initiated and completed but the full dose is not delivered.
Therapy Malfunction	A critical failure has occurred, preventing therapy delivery.

AED Events

Table 82 **AED Mode Event Information**

Logged Event	Cause of the Event
Analyzing	The algorithm begins analysis.
Artifact Detected	Artifact has been detected.
Shock Advised	The algorithm detects a shockable rhythm.
No Shock Advised	The algorithm detects a non-shockable rhythm.
Cannot Analyze ECG	The algorithm is unable to make a shock/no shock decision.
Forced Pause	The device enters or exits a forced pause.
NSA Pause	The device enters or exits a NSA pause.
NSA Monitoring	The device enters or exits NSA monitoring.
CPR Pause	The device enters or exits CPR pause.

Pacing Events

Table 83 **Pacing Event Information**

Logged Event	Cause of the Event
Pacer Mode Demand / Pacer Mode Fixed	Pacing starts and when the mode is changed.
Pacer Rate (value)	The Pacer Rate is changed.
Pacer Output (value)	The Pacer Output is changed.
Pacing Paused	Pacing is paused.
Pacer Started (rate) (current) (width)	Pacing starts.
Pacing Stopped. Power Interrupted.	Power is restored if pacing is interrupted or stopped due to a power loss and the Therapy knob remains in the Pacer position.
Pacer Output Low (value) < setting (value)	The Pacer Output is less than the selected setting by 20 percent or 10 mA (whichever is greater).
Pacing stopped with reason	The device stops pacing. Reasons include: Pacing Stopped. Pads Off.: Logged when a pads off condition is detected. Pacing Stopped. Device Error.: Logged when a device error that prevents delivery of pacing therapy is detected. Pacing Stopped. Pads Cable Off.: Logged when the Therapy cable is disconnected from the device. Pacing Stopped. Leads Off.: Logged when there is a leads-off condition with the primary ECG lead for pacing.

12-Lead Events

Table 84 12-Lead Event Information

Logged Event	Cause of the Event
12-Lead Acquired	12-lead is acquired.

Printing and Marking Events

Table 85 Printing and Mark Events Information

Logged Event	Cause of the Event
Printer Test Failure	A printer failure occurs during an operational check.
Mark Event	The Mark Event button is pressed.
(Configured Event Text)	Selecting an entry from the Mark Events menu.

Alarm Events

Table 86 Alarms Event Information

Logged Event	Cause of the Event
Alarms On / Alarms Off	Alarms are enabled/disabled.
All Alarms Audio Paused	Alarm audio is paused.
All Alarms Audio Off	Alarm audio is turned off.
Active Alarms Audio Paused	An active alarm's audio is paused.
Active Alarms Audio Off	An active alarm's audio is turned off.

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no vertical margin lines or other markings present.

Operational and Shift Checks

This chapter describes activities associated with shift checks, operational checks, and weekly shock tests,

This chapter is divided into the following major sections:

	Shift Check	p. 197
	Accessing the Operational Check Menu	p. 198
	Operational Check	p. 199
	Weekly Shock Test	p. 205
	Alarm Test	p. 206

Shift Check

To ensure defibrillators are ready when needed, Philips recommends that users complete a checklist, often referred to as a shift check, at the beginning of each change in personnel. These checks are performed in addition to the periodic checks performed by the facility's biomedical or clinical engineering team. Shift check activities include verifying that the appropriate supplies and accessories are present, the device is plugged in and has sufficient battery power, and the device is ready for use.

As part of the shift check, you must verify the device's ability to deliver defibrillation therapy once a week by performing a shock test. Complete this important requirement by performing one of the following:

- Operational check
- Weekly shock test

Shift Checklist

Inspect your HeartStart Intrepid, accessories, and supplies at the change of every shift. Ensure that your organization performs and tracks operational and shift checks according to your organization's policies and requirements.

The following is a list of items to be inspected during a shift check:

- **RFU Indicator:** Green check mark.
 - If **blinking red X**: Plug the device into AC/DC power or insert a charged battery.
 - If **solid red X**: Insert charged battery or plug into AC/DC power. If it persists, call for service.
- **Case:** clean, free from spills and objects.
- **Cables/connectors:** present and inspected.
- **Paddles/Therapy cable:** present, inspected and paddles release from tray, ensure package seal is intact.
- **Multifunction pads:** present, sufficient supply, expiration date checked.

- **Monitoring electrodes:** present, sufficient supply, expiration date checked.
- **Charged batteries:** one in device, spares. Battery gauge checked.
- **AC power cord:** plugged in, green light on
- **Printer paper:** present, sufficient supply.
- **USB drive:** present.
- **SpO₂ sensors (if installed):** present, sufficient supply.
- **NBP cuffs/tubing (if installed):** present, sufficient supply.
- **Temperature sensors (if installed):** present, sufficient supply.
- **CO₂ cannulas, extension lines, and dehumidification tubes (if installed):** present, sufficient supply.

Accessing the Operational Check Menu

You can access the following items from Operational Check menu:

- **Run Op Check.** For more information, see [“Performing an Operational Check”](#) on page 199.
- **Op Check Summary.** Displays a summary of the last 60 operational checks stored in the device. You can use the Smart Select knob to print or export the summary. For an example image, see [Figure 70](#).
- **Auto Test Summary.** Displays a summary of automated test results currently stored in the device. For more information, see [“Automated Tests”](#) on page 208.

Ⓢ To access the Operational Check menu:

- 1 Turn the Therapy knob to Monitor.
- 2 Press the Smart Select knob.
- 3 Turn the Smart Select knob to highlight **Other** and press the Smart Select knob.
- 4 Select **Operational Check** and press the Smart Select knob.
- 5 In the Operational Check menu, turn the Smart Select knob to select the item you want and press the Smart Select knob.

Figure 70 **Operational Check Summary Screen**

Operational Check Summary					
			02 Feb 2018 12:34 pm 		
#	Date and Time	Result	#	Date and Time	Result
1	18 Feb 2019 12:34	Pass			
2	15 Feb 2019 23:45	Pass			
3	14 Feb 2019 01:23	Pass			
4	12 Feb 2019 21:56	Fail/DX			
			Operational Check Summary		
			Run Op Check		
			Auto Test Summary		
			Print		
			Export		
			Exit		
Exit Summary					

Operational Check

An operational check (Op Check) includes the following tests: General system, Therapy knob, Charge button, Shock button, Audio, Sync button, Therapy delivery, CPR meter 2, Leads ECG, Pads/Paddles ECG, Battery, Wi-Fi, Cellular, SpO₂, NBP, EtCO₂, Temperature, and Printer.

Performing an Operational Check

Perform an operational check weekly to supplement automated tests:

- Do not run an operational check with internal paddles attached. Perform a weekly shock test to test internal paddles.
- To confirm that the ECG cable used during an event is functioning properly, use that same cable during the operational check.

Before performing an operational check:

- **If using external paddles:**
 - Ensure the paddles are connected to the device, that the paddles and the paddle tray are thoroughly clean, and that no debris or residue (including all conductive material) is on the electrode surfaces of the paddles and tray.
 - Secure the paddles in the tray and confirm that the Patient Contact Indicator (PCI) LEDs are not lit. If the LEDs are lit, adjust the paddles in the tray. If the LEDs remain lit, clean both the adult and infant/child paddle electrode surfaces.
- **If using multifunction electrode pads:** Ensure the pads therapy cable is plugged into the defibrillator test plug or test load.

WARNING: When performing the operational check, ensure that the device is not connected to a patient.

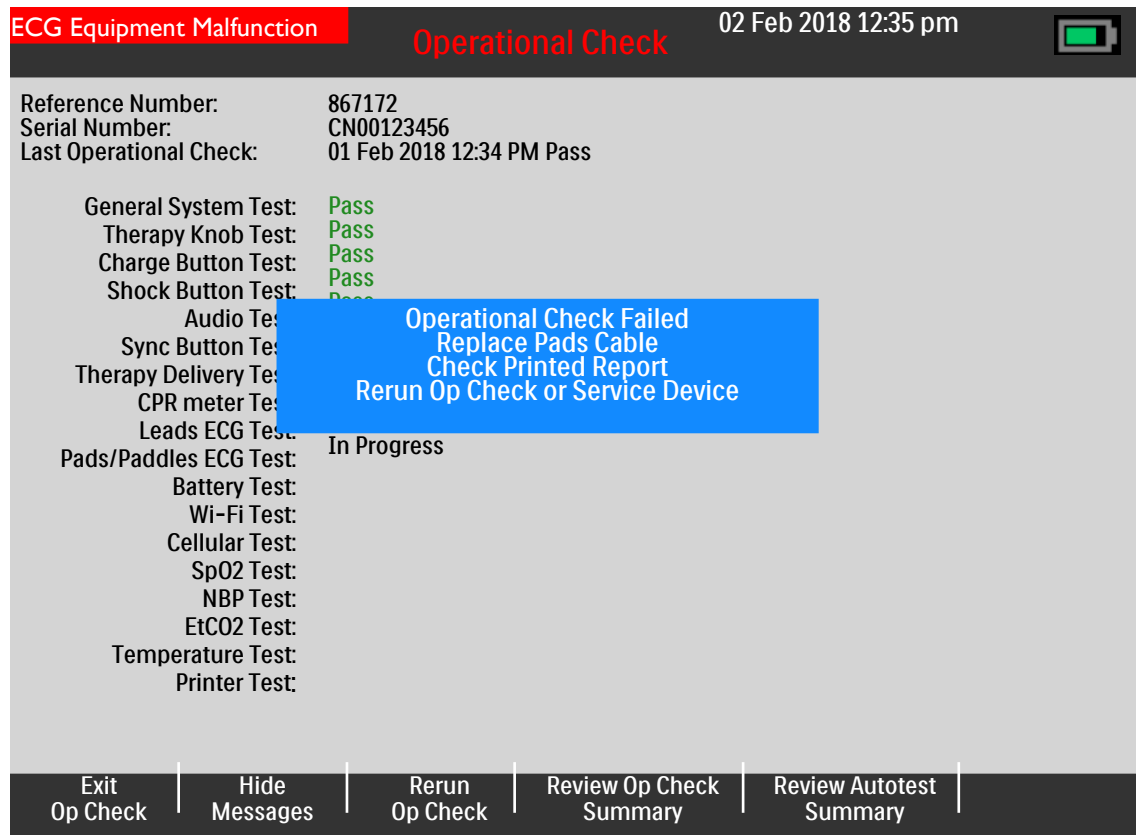
☉ To perform an operational check:

- 1 Confirm that the device has a charged battery and an ECG cable connected (but not connected to a patient or lead sets).
- 2 Confirm that a test load or a test plug is connected to the Therapy Cable.
- 3 Turn the Therapy knob to 170 J.
- 4 Press the Smart Select knob.
- 5 Turn the Smart Select knob to highlight **Other** and press the Smart Select knob.
- 6 Select **Operational Check** and press the Smart Select knob.
- 7 Select **Run Op Check** and press the Smart Select knob. The message **Leaving clinical mode. Patient monitoring will be turned off.** appears.
- 8 Select **Yes**, and press the Smart Select knob to start the operational check. The Operational Check screen appears.

If the HeartStart Intrepid is not set up correctly, a message with the required changes and a **Proceed As Is?** prompt appear. If you proceed without proper setup, the operational check may fail.

- 9 During the operational check, when a response is required, use the Smart Select knob to select your answer and press the Smart Select knob to confirm your choice. As each test runs, the name of the test is highlighted on the display with the message **In Progress**.
- Once the **Sync** button is pressed, leave the HeartStart Intrepid unattended as the operational check completes. If you exit or cancel the operational check before it completes all tasks, it is not saved as part of the Op Check Summary.
- 10 When the operational check completes, on the Operational Check screen, review the summary note. For an example of a summary note for a failed operational check, see [Figure 71](#).

Figure 71 Operational Check Results Screen



- 11 As needed, perform the recommended actions from the summary note and use the soft keys to perform additional tasks:
- Exit Op Check
 - Hide and show messages
 - Rerun Op Check
 - Review Op Check Summary
 - Review Autotest Summary
- 12 If you want, print the operational check report:
- Press the Smart Select knob. An additional operational check menu appears and includes a Print option.
 - Select the Print option and press the Smart Select knob to print the operational check report.

NOTE: If configured, the operational check report will print automatically. For configuration information, see “Configuration – Printing” on page 172.

- 13** After a successful operational check, complete the user checks listed on the operational check report. For more information, see “User Checks” on page 205.
- Upon completing the operational check and returning to a clinical mode, all settings return to the device’s configured values.

Operational Check Results and Failures

For a list of operational check tests and results, see [Table 87](#).

Note the following considerations related to operational check failures:

- An improperly performed operational check may cause a failure. To clear the failed operational check, successfully perform a proper operational check. If the device continues to fail the operational check, remove the device from use and call for service.
- If an operational check fails for a therapy-related problem (such as a failed Therapy knob or button), therapy is disabled. Messages appear on the display, and the RFU indicator is a solid Red **X**. After exiting the operational check, the HeartStart Intrepid restarts with therapy disabled.
- When exiting the operational check, if the failure is related to the Therapy knob, restart and remain in Monitor mode regardless of the knob’s position on the dial. If the device does not turn off with the knob in the OFF position, take it out of use and call for service.
- If the Leads ECG test fails, the HeartStart Intrepid may provide the message **Leads ECG Test Failed With Cable. Disconnect ECG Cable to Rerun Test Without Cable**. When the ECG cable is removed, the device reruns the operational check. Press the Smart Select knob to proceed without rerunning the Leads ECG test.

Table 87 Operational Check Tests and Results

Test	Device Prompt	User Action	Results	What to do if fails
General System: tests internal clock battery, power supply and internal memory	None	None	Pass: All tested systems are functioning properly. Fail: One or more of the tested systems is not functioning properly.	Take the device out of use and call for service.
Therapy Knob: tests if the Therapy knob is set to 170 J and functioning properly	None	Confirm the Therapy knob is at 170 J.	Pass: The Therapy knob is set to 170 J and functioning properly. Fail: The Therapy knob is not set to 170 J. Fail: The Therapy knob is not functioning properly. NOTE: If the Therapy knob fails, the device restarts and remains in Monitor mode regardless of the Therapy knob position.	Confirm that the Therapy knob is set to 170 J and run an operational check again. If the test continues to fail, take the device out of use and call for service.

Table 87 Operational Check Tests and Results (Continued)

Test	Device Prompt	User Action	Results	What to do if fails
Charge button: tests the Charge button function with a Therapy Cable	Turn the Knob to 150J Verify Test Load Is Attached Press the Charge Button	Move Therapy knob to 150. Confirm test load or test plug is attached and press the Charge button.	Pass: Charge button passed. Fail: Charge button is not functioning. Fail: The Smart Select knob was used to charge.	Repeat the test and make sure you press the Charge button. If continues to fail, take the device out of use and call for service.
Charge button: tests the Charge button function with External Paddles	Turn the Knob to 150J Verify Paddles are in Holders Press the Charge Button	Move Therapy knob to 150. Confirm the paddles are seated in their pockets and press the Charge button.	NOTE: If the device does not detect a pressed Charge button within 10 seconds, you are prompted to use the Smart Select knob to charge.	
Shock button: tests the Shock button function	Press Shock Button or Press Both Shock Buttons on Paddles.	Press the Shock button on the device or paddles.	Pass: Shock button passed. Fail: - Shock button is not functioning. - You used the Smart Select knob to shock. - Device disarmed automatically.	Repeat operational check and make sure you press the Shock button before the defibrillator disarms. If operational check continues to fail, take the device out of use and call for service.
	If the device does not detect a pressed Shock button within 10 seconds, you are prompted to use the Smart Select knob to shock. NOTE: The device auto disarms after the time specified in Configuration (see Table 59 on page 169). A Defib Disarmed message is displayed.			
Audio: tests the speaker system	The device announces: Shock Delivered	Did you hear the announcement? Using the Smart Select knob, select Yes or No . Press the Smart Select knob.	Pass: You responded that you heard the audio test prompt. Fail: You did not respond or responded that you did not hear the audio test prompt.	Repeat operational check. If it continues to fail, take the device out of use and call for service.
Sync Button: tests the Sync button function	The device prompts you to Press and Release Sync Button . Press and release the Sync button. If the device does not detect a pressed Sync button within 10 seconds, you are prompted to use the Smart Select knob to proceed.		Pass: Sync button passed. Fail: Sync button is not functioning.	Repeat operational check and make sure you press the Sync button. If it continues to fail, take the device out of use and call for service.

Table 87 Operational Check Tests and Results (Continued)

Test	Device Prompt	User Action	Results	What to do if fails
Therapy Delivery: tests defibrillation and pacing circuitry and delivers a shock	None	None	Pass: test passed with the specified cable type connected. Fail: test failed with the specified cable type connected.	Repeat operational check using a different cable. If it passes, remove the defective cable from use. If it continues to fail, take the device out of use and call for service.
CPR meter: tests the Q-CPR function	None	None	Pass: Q-CPR works as specified. Fail: Q-CPR does not work as specified. No Meter: Pads/CPR cable connected, Q-CPR meter 2 not connected. Not Tested: Pads/CPR cable not connected.	• Ensure the CPR meter 2 does not move during the test. • Replace the CPR meter 2 if persists. • Check Pads/CPR cable or CPR meter 2 as applicable.
Leads ECG: tests leads ECG acquisition and the ECG cable	None	None	Pass: Tested system is functioning properly. Fail: Tested system is not functioning properly.	Rerun the Leads ECG test when prompted at the end of the operational check. If it continues to fail, take the device out of use and call for service.
Pads/Paddles ECG: Checks ECG acquisition with pads/paddles	None	None	Pass/cable type: ECG acquisition and the cable are both functioning. Pass/No Cable: ECG acquisition is functioning; cable not tested. Fail/Cable type: ECG acquisition and/or the cable specified are not functioning.	If operational check fails with a cable connected, replace the cable and run the test again. If it continues to fail, take the device out of use and call for service.
Battery: tests battery capacity	None	None	Op Check does not start if there is no battery in the slot.	Insert a charged battery.
			Pass: battery is functioning properly and charged.	
			Fail: Battery has reached end of its life.	Replace the battery.
			None: Battery is not inserted:	Insert a charged battery.
			Low: low battery.	Charge the battery.

Table 87 Operational Check Tests and Results (Continued)

Test	Device Prompt	User Action	Results	What to do if fails
Wi-Fi: tests whether Wi-Fi hardware is working properly	None	None	Pass: Wi-Fi passed test. Fail: Wi-Fi failed test.	Call for service.
Cellular: tests whether the Wireless Communication Module is working properly	None	None	Pass: Test passed. Fail: Test failed. Not tested: Wireless Communication Module not connected.	Call for service.
SpO₂: tests internal SpO ₂ function (cable is not tested)	None	None	Pass: SpO ₂ passed test. Fail: SpO ₂ failed test.	Call for service to repair the SpO ₂ module. If SpO ₂ monitoring is essential to patient care, take the device out of use.
NBP: tests internal NBP function	None	None	Pass: NBP passed test. Fail: NBP failed test.	Call for service to repair the NBP module. If NBP monitoring is essential to patient care, take the device out of use.
EtCO₂: tests the external sensor and the device's ability to measure EtCO ₂	None	None	Pass: EtCO ₂ passed test. Fail: EtCO ₂ failed test.	Call for service to repair the CO ₂ module. If CO ₂ monitoring is essential to patient care, take the device out of use.
Temperature: tests whether the temperature hardware is working properly.	None	None	Pass: temperature hardware passed its self-test. Fail: temperature hardware failed its self-test.	Call for service.
Printer: runs a printer self test	None	None	Pass: Printer passed its self-test. Fail: Printer failed its self-test.	Call for service.

User Checks

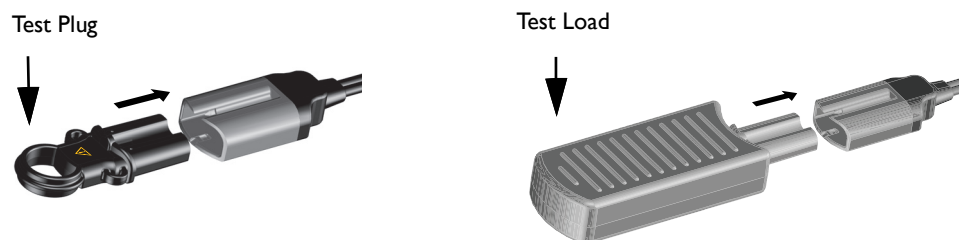
After completing a successful operational check, the following manual checks are recommended:

- **Defibrillator Inspection.** Ensure that the HeartStart Intrepid is clean (including the surfaces of the paddles and paddle trays), clear of objects, and has no visible signs of damage.
- **ECG Cables, connectors, paddles, pads, monitoring electrodes.** Ensure that there are no visible cracks, broken wires, or other visible signs of damage. Ensure all the connections are secure. Check expiration date and quantity of pads and monitoring electrodes.
- **Charged Battery.** Ensure that a charged battery is installed in the HeartStart Intrepid. Another charged battery should be available or charging. Confirm that the battery has no visible signs of damage.
- **AC and DC power cords.** Connect the AC/DC power cord to the HeartStart Intrepid and plug the cord into a power outlet. Verify that the external power indicator on the front panel is lit.
- **Printer Paper.** Ensure that the printer has sufficient paper and prints properly.
- **SpO₂ Sensor.** Inspect the sensor and cable for visible signs of damage.
- **EtCO₂ accessories.** Inspect the cannulas, adapters, dehumidification tubes, and extension lines for blockages and visible signs of damage.
- **EtCO₂ Port.** Inspect the port for visible signs of debris or damage.
- **NBP Cuffs and Tubing.** Inspect the pressure cuffs and tubing for visible signs of damage.
- **Temperature Sensor.** Presents sufficient supply.
- **CPR meter and adhesive pads.** Inspect for visible signs of damage. Check expiration date and quantity of pads.
- **USB Connector.** Inspect the connector for visible signs of debris or damage.

Weekly Shock Test

You can use the defibrillator test plug (included with the device), test load (ordered separately), or external paddles to perform a weekly shock test. The weekly shock test process differs depending on how the test is performed.

Figure 72 Connecting the Defibrillator Test Plug or Test Load



WARNING: When performing a weekly shock test, ensure that the HeartStart Intrepid is not connected to a patient.

NOTE: Internal paddles are tested before each use; a weekly shock test for internal paddles is not necessary. For more information, see the internal paddles instructions for use.

☉ To perform a weekly shock test:

	If using pads with a test load:	If using pads with a test plug:	If using external paddles:
1	Turn the device on by turning the Therapy knob to 150 J.		
2	Connect the Therapy cable to the defibrillator and test load to the end of the Therapy cable.	Connect the Therapy cable to the defibrillator and test plug to the end of the Therapy cable.	WARNING: Make sure the external paddles and paddle tray are clean and free of debris or residue (including all conductive material) on the electrode surfaces. If the external paddles or tray are dirty, sparking may occur during a weekly shock test. Secure paddles in tray and confirm PCI LEDs are not lit. If the LEDs are lit, adjust paddles in tray. If the LEDs continue to light, clean both the adult and infant paddle electrode surfaces.
3	Press the Charge button on the front panel. Confirm you hear the charging tone. If it becomes necessary to disarm the defibrillator, press [Cancel Charge] .		Press the Charge button on the paddles sitting in the tray. Confirm you hear the charging tone. If it becomes necessary to disarm the defibrillator, press [Cancel Charge] .
4	Press the Shock button on the HeartStart Intrepid.		Simultaneously press the Shock buttons located on the paddles.
5	A strip prints, if configured to do so. If the strip does not print immediately, press the Print button.		
6	Confirm the printed strip indicates Test Passed . If not, confirm you did the test properly before taking the device out of use and calling for service.		
7	Detach test load/plug from the Therapy cable so your device is ready for use when needed. Do not leave the test load/plug attached to the Therapy cable. Test complete.	Confirm that the device issues a Shock Cancelled audio message, displays a Shock Aborted message, and that a printed strip indicates Test Passed. If not, confirm that the test was performed properly before taking it out of use and calling for service.	Confirm that the device issues a Shock Cancelled audio message, displays a Shock Aborted message, and that a printed strip indicates Test Passed. If not, confirm that the test was performed properly before taking it out of use and calling for service. It is normal for a shock to not be delivered in this instance.

Alarm Test

If your institution's protocol requires periodic alarm verification and you want to perform an alarm verification test (in a non-clinical environment) outside of operational check testing, connect the HeartStart Intrepid to a simulator, then manually change the alarm limits to a setting that should cause the device to alarm. Look at the display and listen for the alarm. Be sure to reset the alarm limits to the appropriate settings before returning the device to a clinical environment.

Maintenance

This chapter describes how to care for your HeartStart Intrepid and its accessories.

This chapter is divided into the following sections:

	Overview	p. 207
	Automated Tests	p. 208
	Battery Maintenance	p. 210
	About Cleaning and Disinfecting the Device and Accessories	p. 213
	Cleaning the Device	p. 214
	Cleaning Device Accessories	p. 215
	Disinfecting the Device and Accessories	p. 216
	Service and Care of the Cables and Paddles	p. 216
	HeartStart Intrepid Disposal	p. 216

Overview

Routine maintenance is vital to keep the HeartStart Intrepid ready to respond in an emergency:

- Providing power so automated tests can run. For information, see “[Automated Tests](#)” on page 208.
- Observing the Ready For Use (RFU) indicator to confirm the device’s readiness.
- Performing operational checks and shift checks. For information, see “[Operational and Shift Checks](#)” on page 197.
- Caring for batteries. For information, see “[Battery Maintenance](#)” on page 210.
- Cleaning the device and accessories. For information, see “[About Cleaning and Disinfecting the Device and Accessories](#)” on page 213.
- Checking expiration dates on supplies and accessories and ordering replacements.
- Verifying the CapnoTrak Module flow rate accuracy every 12 months by direct measurement using a calibrated flow meter.

WARNINGS: HeartStart Intrepid service should only be performed by qualified service personnel, in accordance with the HeartStart Intrepid *Service Manual*.

Do not service this device while in use with a patient.

Electric shock hazards exist internally. Do not open device.

Automated Tests

The HeartStart Intrepid performs many maintenance activities, including three tests that run automatically at regularly scheduled intervals when power is supplied and the device is off. The tests assess operational performance and alert you if a problem exists.

Results of tests associated with critical device functionality are reported through the RFU indicator and the Automated Test Summary Report. Results are also reported through statements on the HeartStart Intrepid's display when the device is turned on. [Table 88](#) provides a brief explanation of the tests and lists each test's frequency.

Table 88 Automated Tests

Test	Frequency	Description
Hourly	Every hour	Tests power supply, charge level of the battery, internal communication across all critical modules and components and also the device's internal temperature.
Daily	Daily after midnight according to the device's internal clock	Tests all hourly components as well as defibrillation, ECG, pacing, SpO ₂ , NBP and the printer.
Weekly	Weekly, after midnight Sunday morning according to the device's internal clock	Tests all daily components as well as various electrical circuit tests and administers a 150 J shock internally to test the defibrillation circuitry.

NOTE: If the HeartStart Intrepid is turned on in the middle of an automated test, the test stops and the device starts in normal operating mode.

Automated Test Summaries

You can review, print, and export all automated test summaries.

☉ To view an automated test summary:

- 1 Turn the Therapy knob to Monitor.
- 2 Press the Smart Select knob.
- 3 Turn the Smart Select knob to highlight **Other** and press the Smart Select knob.
- 4 Select **Operational Check** and press the Smart Select knob.
- 5 Select **Auto Test Summary** and press the Smart Select knob. The message **Leaving clinical mode. Patient monitoring will be turned off.** appears.
- 6 Select **Yes** to exit clinical mode, and press the Smart Select knob to confirm your choice. The Automated Test Summary screen appears.

Figure 73 Automated Test Summary

18 Feb 2018 12:56 pm



Auto Test Summary

Date and Time	Period	Result	Date and Time	Period	Result
18 Feb 2019 12:34	Hourly	Pass	27 Jan 2019 00:13	Weekly	Pass
18 Feb 2019 00:12	Daily	Pass	20 Jan 2019 00:12	Weekly	Pass
17 Feb 2019 00:11	Daily	Pass	13 Jan 2019 00:11	Weekly	Pass
16 Feb 2019 00:13	Daily	Fail/D	06 Jan 2019 00:13	Weekly	Pass
15 Feb 2019 00:11	Daily	Pass	30 Dec 2018 00:13	Auto Test Summary	
14 Feb 2019 00:12	Daily	Pass	23 Dec 2018 00:12	Run Op Check	
13 Feb 2019 00:12	Daily	Pass	19 Dec 2018 00:11	Op Check Summary	
13 Feb 2019 00:13	Weekly	Pass	09 Dec 2018 00:13	Print	
10 Feb 2019 00:12	Weekly	Pass	02 Dec 2018 00:12	Export Summary	
03 Feb 2019 00:11	Weekly	Fail/BW	25 Nov 2018 00:11	Export Detail	
			Exit		
Exit Op Check					

Auto Test Summary Results

The Automated Test Summary includes results for the hourly, daily, and weekly tests that have been performed. The AutoTest Summary lists the result of the most recent hourly test, the six most recent daily tests, and the configured number of weekly tests. The following table describes each result and the corresponding RFU Indicator display.

Table 89 Auto Test Summary Results

Result	RFU Indicator	Definition	Required Action
Pass	Green check	All tests passed.	None.
Fail/DX	Solid red X, chirp	Service required. A critical device failure has been detected.	Turn the Therapy knob to Monitor. A message indicating the problem is displayed.
Fail/BW	Blinking red X	Service is not required but the battery is low or malfunctioning.	Charge the battery as soon as possible or replace it with a charged battery. You can charge the battery in the HeartStart Intrepid by connecting the device to AC/DC power.
Fail/CX	Solid red X, chirp	An ECG cable failure has been detected.	Replace the ECG cable and rerun the operational check.
Fail/D	Green check	A non-critical failure has been detected.	Turn the Therapy knob to Monitor. A message indicating the problem is displayed.

Printing and Exporting Auto Test Summaries

You can print the Auto Test Summaries or export them to a USB drive using the menu options. You can use **Export Detail** if requested by your support or service personnel.

Battery Maintenance

Battery maintenance is essential to ensure sufficient charge and capacity for device operation, optimal battery life, and accurate charge state reporting:

- Battery maintenance begins when you first receive your device and continues throughout the life of the battery.
- Keep the HeartStart Intrepid lithium ion battery charged and a spare battery nearby.
- If you have a faulty battery, remove it from service immediately.

Table 90 Battery Maintenance Activities

Activity	When to perform
Visual inspection	As part of a standard operational check.
Charge the battery	Upon receipt; after use; if the Low Battery message is displayed.
Store the battery	When not in use for an extended period of time, store the battery at a 20-40% charge.
Discard the battery	When there are visual signs of damage or you receive a message to replace the battery.

Battery Useful Life

When properly cared for and used in its intended environment, the battery has an approximate useful life of three years in low use environments (5-10 hours per week) and 1.5 years in high use environments (25-30 hours per week). To optimize performance, charge a low battery as soon as possible. Using the battery outside of intended conditions may reduce battery life.

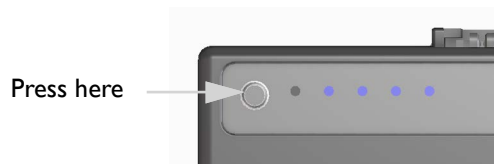
CAUTION: Do not store your device for prolonged periods with the battery installed.

Checking the Battery Charge

You can check the current charge status of a battery by:

- When the battery is not installed in the HeartStart Intrepid, press the battery power gauge, located on the end of the battery opposite the battery tab. Each solid blue light indicates approximately 20 percent charge. A flashing blue light farthest from the button indicates the battery is too weak and must be recharged before use.

Figure 74 Battery Power Gauge



- When the battery is installed in the HeartStart Intrepid, turn the Therapy knob to any position and observe the battery power indicators displayed in the Status Area.

WARNING: Use only approved batteries to power the HeartStart Intrepid. Use of non-approved batteries could affect performance and results.

Low Battery Conditions

To optimize performance, a battery that is in the low battery condition (less than 40%) should be charged as soon as possible.

The HeartStart Intrepid enters a low battery condition when:

- The battery charge is low but has sufficient power to provide at least six full-energy charge/shock cycles and at least 10 minutes of pacing or monitoring.
- The HeartStart Intrepid cannot determine the battery's charge level.

NOTE: The longer the battery stays in the low battery condition without charging, the ability to deliver six full-energy shocks and perform 10 minutes of pacing or monitoring diminishes.

Initializing Batteries

When opening a new battery for the first time, it needs to first be charged before the fuel gauge lights activate.

Charging Batteries

The battery needs to be charged in the HeartStart Intrepid or in a Philips stand-alone battery charger. Insert the battery to be charged in the battery compartment and then plug the device into an AC/DC power outlet. The optimal temperature range for charging a battery is from 5°C to 30°C (36°F to 86°F).

With the ambient temperature at 25°C (77°F), AC/DC power connected, and the device turned off, the following charge times apply to the battery:

- Less than 3 hours to 100% capacity
- Less than 2.5 hours to 90% capacity
- Less than 2 hours to 80% capacity

When AC/DC power is supplied, the battery charging indicator flashes green to indicate the battery is charging and the battery is $\leq 90\%$ charged. The indicator turns solid green when the battery charge is $> 90\%$ of capacity and AC/DC power is present. If no battery is installed or the installed battery is not functioning properly, the light remains off.

Storing Batteries

Batteries should be rotated regularly to ensure even usage. When storing batteries, make sure the battery terminals do not come in contact with metallic objects.

The following practices are recommended to store a battery:

- Store the battery from 15°C to 35°C (59°F to 95°F) and from 25% to 75% relative humidity, non-condensing.
- For optimal battery life, the recommended charge level of a stored battery is 20% to 40%. Check the charge level of the stored battery every two months, and recharge the battery if it is below 20%.

- For battery storage up to six months, the battery should be removed from the device and charged to approximately 60%. Check the battery at least every six months, and recharge the battery to 60% as needed.
- Charge the stored battery to full capacity before use.

CAUTIONS: Do not store your device for prolonged periods with the battery installed.

Storing batteries in the HeartStart Intrepid, if the device is out of service for an extended period of time, drains the battery.

Discarding Batteries

Batteries should be discarded if there are visual signs of damage. They should be discarded in an environmentally safe manner.

WARNINGS: Properly dispose of or recycle batteries according to local regulations. Do not puncture, disassemble, or incinerate batteries.

Be careful not to short the battery terminals because this could result in a fire hazard.

General Battery Safety

The following general warnings and cautions apply to the HeartStart Intrepid battery. Additional warnings and cautions specific to a particular battery feature are provided in the appropriate sections.

WARNINGS: Built-in safety circuits cannot protect against handling abuse. Adhere to all warnings and cautions in handling and using lithium ion batteries.

Keep batteries away from flame and other heat sources. Do not incinerate.

Do not short circuit or reverse polarity of the battery. Avoid placing batteries around metal objects that may short circuit the battery. Do not directly connect the negative and positive terminals.

Avoid getting batteries wet or using batteries in high humidity environments.

Do not puncture, crush, dent, drop, physically shock or allow any deformation of the batteries.

Do not disassemble or open batteries. Do not attempt to alter or bypass the safety circuit.

Use only in the HeartStart Intrepid and charge only in the specified battery charger. Do not charge near a heater or in hot sunlight.

Do not connect the battery to any plug socket or to any other equipment.

CAUTIONS: Use caution when handling, using and testing batteries. Do not touch a leaking battery.

Do not expose batteries to temperatures below -20°C (-4°F) or greater than 50°C (122°F). Excess temperatures may result in battery damage.

Wash skin with large amounts of water in the event of electrolyte leakage to prevent skin irritation and inflammation.

Power-Related Alarms

Power-related alarms are generated for the conditions shown in [Table 91](#). Once generated, they appear as alarm messages on the HeartStart Intrepid display. There are both audio and visual alerts. For more information on alarms, see “[Alarms](#)” on page 37.

Table 91 Power-Related Alarms

Alarm Message	Condition	Type of Alarm	Indication and Location
Low Battery	Battery power is low.	High Priority if pacing otherwise, low priority non-latching alarm	Red alarm message if pacing, cyan if not with audio tone in Battery Status area.
Shutting Down in 1 min	Battery power is critically low. The device will shut down in 1 minute.	High Priority if pacing otherwise, medium priority non-latching alarm	Red alarm message if pacing, yellow if not with audio tone in Battery Status area.
Shutting Down Now	Battery power is critically low. The device is shutting down now.	High Priority Non-Latching	Red alarm message with audio tone in Battery Status area.
Incompatible Battery	An incompatible battery has been inserted into the device.	High priority Non-Latching	Red alarm message with audio tone in Technical Alarm area.
Equipment Disabled: System Failure	A low voltage has been detected.	High Priority Non-Latching	Red alarm message with audio tone in Technical Alarm area.
Battery Communication Failure	Communications between the device and the battery have failed.	Medium Priority Non-Latching	Yellow alarm message with audio tone in Technical Alarm area.
Replace Battery	The battery has reached its end of life.	Low Priority Non-Latching	Cyan alarm message with audio tone in Technical Alarm area.

About Cleaning and Disinfecting the Device and Accessories

Note the following considerations when maintaining the device and accessories:

- Internal paddles must be cleaned and sterilized (not disinfected). For instructions, see the Internal Paddles *Instructions for Use*.
- If an accessory has cleaning and disinfecting instructions from the manufacturer or as part of your organization’s policy, use those instructions.
- For cleaning and disinfection frequency of the device and individual accessories, follow your organization’s policy.

Supplies for Cleaning and Disinfecting

The following supplies are required to clean and disinfect the device and its accessories. Note the following:

- Ensure you have enough wipes and brushes to clean and disinfect the item. Do not reuse wipes and brushes. Reusing wipes and brushes can recontaminate the item.
- Follow your organization's process to dispose of contaminated wipes and brushes.

Table 92 Supplies for Cleaning and Disinfecting

Cleaning Supply	Description
Non-linting wipes that can be wetted	Used to remove contaminants from the device and its accessories
Dry non-linting wipes	Used to dry the device and accessories
Soft bristle brush	Recommended to clean difficult surfaces, such as buttons, seams, ridges, cavities, and so on
Cleaning and disinfecting solution	For cleaning and disinfecting, use 70% isopropyl alcohol

Safety Considerations

Review the following safety considerations to help prevent damage to the device or device accessory during cleaning and disinfecting.

-
- CAUTIONS:**
- Do not steam autoclave, steam sterilize, or ultrasonically clean the device or device accessory unless otherwise indicated by the manufacturer's instructions.
 - Do not use a detergent or solution other than what is indicated in the manufacturer's instructions or this *Instructions for Use* document.
 - Do not immerse, pour liquid on, or allow liquid to penetrate the device or device accessory.
 - Do not allow excess liquid to contact electrical parts or connectors during cleaning.
-

Cleaning the Device

Before cleaning the device, note the following actions to prevent damage and contamination:

- ⦿ **To prepare the device before cleaning:**
 - 1 Disconnect the device from power.
 - 2 Remove all cables and accessories from the device, including the external paddles. For accessory connection information, see [“Device Basics”](#) on page 9.
 - 3 If the device or accessories are transported for cleaning, follow your organization's policies to ensure that all items are secured.
- ⦿ **To clean the device:**
 - 1 For the exterior surfaces of the printer door and latch, use non-linting wipes wetted (but not dripping) with the cleaning agent to wipe the surfaces thoroughly for 30 seconds.

- 2 For the exterior surfaces, use non-linting wipes wetted (but not dripping) with the cleaning agent to wipe the surface for at least three minutes and until visibly clean. If necessary, use soft-bristled brushes to clean difficult surfaces. Difficult surface may include buttons, seams, ridges, cavities, and so on.
- 3 Use dry, non-linting wipes to dry all the cleaned surfaces of the device.
- 4 Inspect the device in a well-lit area to ensure that all surfaces are clean. If any surfaces remain contaminated, repeat the cleaning steps until all surfaces of the device are visibly clean.

Cleaning the Device Printhead

You may need to clean the device printhead if printouts from the device have light or varying print density. You do not need to clean the device printhead as part of the regular cleaning and disinfecting frequency of the device.

The printhead surface is in the top front of the printer compartment.

☉ To clean the device printhead:

- 1 Open the printer door.
- 2 Remove the printer paper.
- 3 Use a non-linting wipe or soft-bristle brush wetted (but not dripping) with the cleaning agent to wipe the printhead surface.
- 4 If necessary, allow the printhead surface to air-dry.
- 5 Reinsert the roll of paper and close the printer compartment door.
- 6 Perform a test print to check the print quality.

Cleaning Device Accessories

For device accessories that do not have cleaning instructions from the manufacturer or as part of your organization's policies, use the following steps to clean the accessory.

☉ To clean device accessories:

- 1 Use non-linting wipes wetted (but not dripping) with the cleaning agent to wipe the accessory for at least three minutes and until visibly clean. Note these additional considerations:
 - For cords and cables, wipe from the device connection outward.
 - If necessary, use soft-bristled brushes to clean difficult surfaces. Difficult surfaces may include buttons, seams, ridges, cavities, and so on.
 - If cleaning reusable noninvasive blood pressure cuffs, hoses, and related parts, detach parts that can collect liquid. Point the parts downward so that any liquid from cleaning can properly drain from the parts.
- 2 Use dry, non-linting wipes to dry all the cleaned surfaces of the device accessory.
- 3 Inspect the accessory in a well-lit area to ensure that all surfaces are clean. If any surfaces remain contaminated, repeat the cleaning steps until all surfaces of the accessory are visibly clean.

Disinfecting the Device and Accessories

Use the following steps to disinfect the device. For accessories, note the following:

- If an accessory has disinfecting instructions from the manufacturer or as part of your organization's policy, use those disinfecting instructions.
- If you are unsure whether an accessory must be disinfected, follow your organization's policy.

© **To disinfect the device or device accessory:**

- 1 For all exterior surfaces of the device or accessory, use non-linting wipes wetted (but not dripping) with 70% isopropyl alcohol until all surfaces are visibly wet.
- 2 Ensure that all surfaces remain visibly wet for at least 10 minutes. If a surface begins to dry early, repeat step 1.
- 3 After 10 minutes, use dry, non-linting wipes or cloths to dry the surfaces.

Service and Care of the Cables and Paddles

Life expectancies for the HeartStart Intrepid therapy cable and external paddles are related to the environment they are used in, their frequency of use and how they are cared for. Their service life is up to three years. To maintain reliable performance and reduce the possibility of failure during patient use, replace the cable and paddles every three years from the time they were initially placed into service or if they fail inspection. Extra care must be taken when using the HeartStart Intrepid in transport and EMS environments that place additional stress on the cable connection and increase the chance for wear, impacting its useful life.

HeartStart Intrepid Disposal

Before disposing of the HeartStart Intrepid, do the following:

- Remove patient data. See “[Removing All Identifying Patient Data](#)” on page 183.
- Remove the battery.
- Follow your country's regulations for disposing of equipment containing electronic parts.

To request a Philips recycling passport to have your device refurbished or recycled, see the following website:

www.philips.com/a-w/about/environmental-social-governance/environmental/circular-economy/recycle

WARNINGS: Disposing the device with the battery inserted presents a potential shock hazard.

To avoid contaminating or infecting personnel, the environment, or other equipment, make sure you disinfect and decontaminate the device and any appropriate accessories prior to disposal.

CPR meter 2 and Adhesive Pad Disposal

The CPR meter 2 contains electronic components. Dispose of it at an appropriate recycling facility in accordance with local regulations. A used patient adhesive pad may be contaminated with body tissue, fluid, or blood. Dispose of it as infectious waste.

Supplies and Accessories

This chapter provides information on the various supplies and accessories for the HeartStart Intrepid. If you have any questions or would like to order accessories and supplies, contact your local Philips sales office or your authorized Philips dealer or distributor.

WARNING: Use only supplies and accessories approved for use with the HeartStart Intrepid. Non-approved supplies can affect performance, results, or protection of the device of a defibrillator discharge.

This chapter is divided into the following sections:

Approved Supplies and Accessories	p. 218
ECG and Defibrillation Accessories	p. 218
Blood Pressure Air Hoses and Cuffs	p. 218
Cable Management and Accessory Storage	p. 219
Data Management Accessories	p. 219
Device Mounting Accessories	p. 219
ECG Monitoring Accessories	p. 219
EtCO2 Monitoring Accessories	p. 221
External Multifunction Pads Cables and Adapters	p. 222
External Paddles	p. 222
Internal Paddles	p. 222
Multifunction Electrode Pads	p. 223
Paper	p. 223
Power Supply Accessories	p. 224
CPR meter 2 Accessories	p. 224
SpO2 Cables and Sensors	p. 224
Temperature Monitoring Probes and Cables	p. 225
Test Loads and Shorted Plugs	p. 225

Approved Supplies and Accessories

Not all accessories and supplies are available in all countries. The list of accessories is subject to change without notice. Supplies and accessories that may contact a person have been biologically evaluated and comply with ISO 10993-1/ GB/T 16886.1.

WARNINGS: Use only multifunction electrode pads, battery, and accessories listed in these *Instructions for Use*. Substitutions may cause the HeartStart Intrepid to function improperly and cause patient injury. For example, some electrodes may be subject to large offset potentials due to polarization.

Use single-use supplies and accessories only once. Reuse may cause a risk of contamination and affect measurement accuracy.

NOTE: ECG electrodes, SpO₂ sensors, NBP cuffs, temperature probes, CO₂ sampling tube, paddles/pads, and the CPR meter 2 are considered applied parts.

ECG and Defibrillation Accessories

Some of the accessories are available in two standards:

- Association for the Advancement of Medical Instrumentation (AAMI)
- International Electrotechnical Commission (IEC)

Use the standards followed by your healthcare institution.

WARNINGS: Use multifunction electrode pads and ECG electrodes prior to their expiration date. Discard after use. Do not reuse pads. Do not use for more than 8 hours of continuous pacing.

Use only approved ECG lead sets and monitoring electrodes with the HeartStart Intrepid. Failure to do so may introduce noise and result in intermittent **Cannot Analyze ECG** messages.

Blood Pressure Air Hoses and Cuffs

Table 93 Blood Pressure Air Hoses

Part Number	Description
989803209761	Adult NBP Air hose 1.5 m
989803209771	Adult NBP Air hose 3.0 m

Table 94 Multi-Patient Easy Care Cuffs, Antimicrobial

Part Number	Description
M4552B	Easy Care cuff, Infant
M4553B	Easy Care cuff, Pediatric
M4554B	Easy Care cuff, Small Adult
M4555B	Easy Care cuff, Adult
M4556B	Easy Care cuff, Adult Long
M4557B	Easy Care cuff, Large Adult
M4558B	Easy Care cuff, Large Adult X-Long

Cable Management and Accessory Storage

Table 95 Cable Management and Accessory Storage

Part Number	Description
989803202941	Intrepid Accessory Storage System
989803202971	Intrepid Rear Pouch
989803202981	Intrepid Carry Case Shoulder Strap
989803190351	Cable Management Straps
989803194281	Therapy Cable Collar

Data Management Accessories

Table 96 Data Management Accessories

Part Number	Description
989803202611	USB data drive
989803202921	Wireless communication module

Device Mounting Accessories

Table 97 Mounting Solutions

Part Number	Description
989803190361	Bedrail Mount
989803217191	Intrepid Docking Station

ECG Monitoring Accessories

ECG Monitoring Electrodes

Table 98 ECG Monitoring Electrodes

Part Number	Description
M2202A	Adult radiotranslucent foam solid gel electrodes, 5 electrodes/pouch (300/case)
989803148821	Small adult radiolucent foam solid gel electrodes, 30 electrodes/pouch (600/case)

3-Lead ECG Cable Sets

Table 99 3-Lead ECG Cable Sets

Part Number	Description	Maximum Cable Length
M1669A	3-lead ECG trunk cable, AAMI / IEC	2.7 m
M1671A	3-lead ICU ECG set, grabber, AAMI	1.0 m
M1672A	3-lead ICU ECG set, grabber, IEC	1.0 m
M1673A	3-lead ICU ECG set, snap, AAMI	1.0 m
M1674A	3-lead ICU ECG set, snap, IEC	1.0 m
M1675A	3-lead OR ECG set, grabber, AAMI	1.0 m
M1678A	3-lead OR ECG set, grabber, IEC	1.0 m
989803173121	3-lead ECG set, disposable, bedside AAMI	1.0 m
989803174201	3-lead ECG set, disposable, bedside IEC	1.0 m

5-Lead ECG Cable and Lead Sets

Table 100 5-Lead ECG Cable Sets

Part Number	Description	Maximum Cable Length
M1644A	5-lead ICU ECG set, snap, limb, AAMI	1.6 m
M1645A	5-lead ICU ECG set, snap, limb, IEC	1.6 m
M1602A	5-lead ICU ECG set, snap, chest, AAMI	1.0 m
M1668A	5-lead ECG trunk cable, AAMI / IEC	2.7 m
M1968A	5-lead ICU ECG set, grabber, limb, AAMI	1.6 m
M1971A	5-lead ICU ECG set, grabber, limb, IEC	1.6 m
M1973A	5-lead OR ECG set, grabber, limb, AAMI	1.6 m
M1974A	5-lead OR ECG set, grabber, limb, IEC	1.6 m
989803173131	5-lead ECG set, disposable, bedside, AAMI	1.0 m
989803174211	5-lead ECG set, disposable, bedside, IEC	1.0 m

12-Lead ECG Cable and Lead Sets

Table 101 12-Lead ECG Cable and Lead Sets

Part Number	Description	Maximum Cable Length
M1663A	10-lead (5+5) ECG trunk cable, AAMI / IEC	2.0 m
M1949A	10-lead (5+5) ECG trunk cable, AAMI / IEC	2.7 m
M1976A	5-lead ICU ECG set, grabber, chest, AAMI	1.6 m
M1978A	5-lead ICU ECG set, grabber, chest, IEC	1.6 m
M1979A	5-lead OR ECG set, grabber, chest, AAMI	1.6 m
M3526A	3-wire lead set plug, snap, AAMI, 1.6 m	N/A
M3527A	7-lead, snap, chest, AAMI, 1.6 m	N/A
M3528A	3-lead set and plug, snap, IEC	1.6 m
M3529A	7-lead ECG set, snap, chest, IEC	1.6 m
989803176161	5-lead ruggedized ECG cable, snap, limb, AAMI	1.6 m
989803176171	5-lead ruggedized ECG cable, snap, chest, AAMI	1.0 m
989803176181	5-lead ruggedized ECG cable, snap, limb, IEC	1.6 m

EtCO₂ Monitoring Accessories

Table 102 EtCO₂ Monitoring Accessories

Part Number	Description
989803198891	CO ₂ Nasal Cannula, Large
989803198901	CO ₂ Nasal Cannula, Medium
989803198911	CO ₂ Nasal Cannula, Small
989803198921	CO ₂ /O ₂ Nasal Cannula, Large
989803198931	CO ₂ /O ₂ Nasal Cannula, Medium
989803198941	CO ₂ /O ₂ Nasal Cannula, Small
989803198951	CO ₂ Oral Nasal Cannula, Large
989803198961	CO ₂ Oral Nasal Cannula, Medium
989803198971	CO ₂ /O ₂ Oral Nasal, Large
989803198981	CO ₂ /O ₂ Oral Nasal, Medium
989803198991	Airway Adapter Set, ET > 4.0 mm
989803199001	Airway Adapter Set, ET ≤ 4.0 mm
989803199011	Water filter Assembly
989803199021	CO ₂ Sampling Extension Line
989803199031	O ₂ Delivery Extension Line
989803199041	Dehumidification Tubing

External Multifunction Pads Cables and Adapters

Table 103 External Multifunction Pads Cables and Adapters

Part Number	Description	Maximum Cable Length
989803197111	Pads adapter cable	2.1 m
989803158661	Hands-free pads cable, Q-CPR, HeartStart connector only (plug-style)	2.2 m

External Paddles

Table 104 External Paddles

Part Number	Description
M3543A	External paddles with PCI, water resistant
M4759A	Paddle electrode replacement for M3543A
989803196431	Efficia external paddles with PCI, water resistant
989803197591	Paddle electrode replacement for 989803196431

Internal Paddles

Table 105 Internal Paddles

Part Number	Description
M4741A	7.5 cm switched internal paddles
M4742A	6.0 cm switched internal paddles
M4743A	4.5 cm switched internal paddles

Multifunction Electrode Pads

Table 106 Multifunction Electrode Pads

Part Number	Description	Maximum Cable Length
M3713A	Adult/child plus multifunction electrode pads, 10 sets/case	1.2 m
M3716A	Adult/child radiolucent multifunction electrode pads, 10 sets/case	1.2 m
M3717A	Infant plus multifunction electrode pads, 5 sets/case	0.6 m
M3718A	Adult/child radiotransparent multifunction electrode pads, 10 sets/case	1.2 m
M3719A	Infant radiotransparent multifunction electrode pads, 5 sets/case	0.6 m
989803139261	SMART Pads II for adults, children, and infants, 1 set	1.2 m
989803149981	SMART Pads III for adults, children, and infants, 1 set	1.2 m
989803149991	SMART Pads III for adults, children, and infants, 5 sets	1.2 m
989803158211	HeartStart adult multifunction electrode pads, 1 set	1.2 m
989803158221	HeartStart adult multifunction electrode pads, 5 sets	1.2 m
989803166021	Adult/child preconnect multifunction electrode pads, 10 sets	1.2 m

Paper

Table 107 Paper

Part Number	Description
989803138171	75 mm chemical thermal paper, 10 rolls

Power Supply Accessories

Table 108 Power Supply Accessories

Part Number	Description
989803202931	DC power module
989803206451 (excluding India)	Rechargeable lithium ion battery pack
989803207131 (India only)	Rechargeable lithium ion battery pack

CPR meter 2 Accessories

Table 109 CPR meter 2 Accessories

Part Number	Description
989803204811	CPR meter 2
989803163291	CPR meter 2 adhesive pads, 10 pack

SpO₂ Cables and Sensors

Table 110 SpO₂ Cables

Part Number	Description	Maximum Cable Length
M1941A	SpO ₂ extension cable	2.0 m
M1943A	Reusable SpO ₂ sensor adapter cable	1.0 m
M1943AL	Reusable SpO ₂ sensor adapter cable	3.0 m

Table 111 SpO₂ Sensors

Part Number	Description	Maximum Cable Length
989803205381	Nasal alar SpO ₂ sensor FAST	0.9 m
989803205391	Multi-compatible alar	N/A
989803205831	Single-patient SpO ₂ sensor, pediatric/adult finger	0.5 m
989803205841	Single-patient SpO ₂ sensor, infant finger	0.9 m
989803205851	Single-patient SpO ₂ sensor, adult finger, infant thumb/toe	0.9 m
989803205861	Adhesive-free SpO ₂ sensor, neonatal foot/hand; infant thumb/great toe; adult finger	0.9 m
989803205901	Reusable SpO ₂ sensor, adult finger	3.0 m

Table 111 **SpO₂ Sensors (Continued)**

Part Number	Description	Maximum Cable Length
M1191B	Reusable SpO ₂ sensor, adult finger	2.0 m
M1191BL	Reusable SpO ₂ sensor, adult finger	3.0 m
989803205871	Reusable SpO ₂ sensor, pediatric/small adult, glove	1.5 m
989803205891	Reusable SpO ₂ sensor, pediatric/adult, ear clip	1.5 m

Temperature Monitoring Probes and Cables

Table 112 **Reusable Temperature Monitoring Probes**

Part Number	Description
989803203561	Esophageal/rectal temperature probe, 12 FR
989803203571	Esophageal/rectal temperature probe, 10 FR
989803203581	Skin surface temperature probe
989803220841 (PR-275PHA)	Esophageal/rectal temperature probe, autoclavable, 9 FR
989803220851 (AR-275PHA)	Esophageal/rectal temperature probe, autoclavable, 12 FR
989803220831 (SPR-275PHA)	Skin temperature probe, autoclavable

Test Loads and Shorted Plugs

Table 113 **Test Loads and Shorted Plugs**

Part Number	Description
M3725A	Test load, 50 Ohm, plug-style
989803171271	Test plug, shorted

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no vertical margin lines or other markings present.

Troubleshooting

This chapter is divided into the following major sections:

 Overview	p. 227
 Responding to Test Results	p. 227
 Device Information	p. 228
 Symptoms	p. 228
 Servicing the HeartStart Intrepid	p. 243

Overview

If the HeartStart Intrepid detects an error or potential problem during use, it displays a technical alarm or a message window with text to guide you. Alarms and messages are often accompanied by a voice instruction or an audible beeping tone. This chapter describes the technical alarms and messages that you may see, along with other symptoms, and provides suggestions for what to do. In addition, this chapter provides an explanation of audible tones and information on contacting your service representative.

If you are unable to resolve a problem using the suggestions in this chapter, run an operational check to determine if there is a malfunction requiring service. If a malfunction is identified, call for service and:

- If the malfunction is related to ECG monitoring, defibrillation, or pacing, remove the device from service.
- If the malfunction is related to SpO₂, EtCO₂, NBP, or temperature, remove the device from service if the function is essential to patient care in your institution.

Responding to Test Results

Results of automated tests associated with critical functions are reported through the RFU indicator and the Automated Test Summary reports. For more information, see “Automated Tests” on page 208.

For information about operational checks and results, see “Operational Check Tests and Results” on page 201.

For further technical and repair information, see the HeartStart Intrepid *Service Manual*.

WARNING: Product servicing and repair should only be performed by qualified service personnel.

Device Information

The Device Information Report provides software and hardware version information about the device:

- Serial number.
- Main Processor PCA.
- SpO₂, CO₂, NBP, and Temp modules. When first turning the HeartStart Intrepid on, the CO₂ sensor needs to warm up for 10 seconds before information is ready for the Device Info Report.
- Printer.
- Software revision.
- Processor module.
- Wi-Fi module.
- Installed options.
- Therapy board.
- Q-CPR.
- Cellular module (known as the Wireless Communication Module).

If an option is not installed on or connected to the device, information related to that option is not included. If there is a failure and the version number cannot be determined, a -?- is displayed as the value.

☉ To view device information:

- 1 Press the Smart Select knob.
- 2 Turn the Smart Select knob to highlight **Other** and press the Smart Select knob.
- 3 Select **Service** and press the Smart Select knob.
- 4 To confirm your selection, select **Yes** and press the Smart Select knob. The device information is displayed.
- 5 If necessary, print the Device Information report or perform another activity.

☉ To print a Device Information report:

- 1 Press the Smart Select knob.
- 2 Turn the Smart Select knob to highlight **Other** and press the Smart Select knob.
- 3 Select **Print Device Info** and press the Smart Select knob to print the report.

Symptoms

The following tables list symptoms, statements, and messages that you may encounter while using the HeartStart Intrepid. The tables also provide possible causes and potential solutions. Symptoms are categorized by functionality.

Try the potential solutions in the order they are listed. The most likely and simple solutions are listed first; the solutions that require effort and less likely to help are listed last.

When troubleshooting issues related to connecting the patient to the HeartStart Intrepid, it is recommended that one single person follow the connection path from the patient to the device to verify a proper end-to-end connection.

Defibrillation and Pacing Problems

Table 114 Defibrillation and Pacing Problems

Symptom	Possible Cause	Potential Solution
Check Pads Connection From Patient to Device message.	A test load or defibrillator test plug is attached to the end of the Therapy Cable.	Remove the test load or defibrillator test plug and attach multifunction electrode pads.
	Pads impedance is less than 10 ohms.	Check pads connection with the patient.
Charge Cancelled message	Therapy cable is not attached. Pads/paddles connection compromised.	Make sure the Therapy cable is connected and the pads/paddles are making proper contact with the patient.
	The Shock button was not pressed within the configured time period.	No action required. If necessary, charge the device and press the Shock button.
Press Paddles Firmly message	A shock has been aborted due to high impedance.	Check paddles connection with the patient. Remove paste, moisture, or any other conductive material between the paddles and patient.
Press Pads Firmly message		Check pads connection with the patient.
Connect Therapy Cable message	The pads or paddles Therapy cable is not connected to the device.	Confirm all cables are properly connected.
Insert Connector, Apply Pads message	The pads cable is not connected to the Therapy cable or pads are not properly applied to the patient.	Confirm all cables are properly connected and pads are correctly placed on the patient.
Energy Limited to 50J message	An energy greater than 50 J was selected with internal paddles connected.	Set energy setting to 50 J or less.
Replace Pads message	A shock has been aborted due to high impedance - second notice.	Replace the pads and check connection with patient.
Reapply Pads to Dry Chest message.	A shock has been aborted due to low impedance.	Confirm proper skin prep and reapply pads.
Paddles Must Not Be Touching Each Other message.		• Confirm that paddles are not touching each other when placed on the patient's chest. • Remove paste, moisture, or any other conductive material between the pads and patient.
Press Pads Firmly message.	A shock was delivered but there was marginal impedance.	Check pads connection with the patient.
Press Paddles Firmly For Next Shock message.		Check paddles connection with the patient.
Paddles Power Overload message.	The device has detected a power overload with the connected paddles.	Run operational check to see if the message clears. If it does not, run operational check with a different set of paddles. If persists, take the device out of use and call for service.

Table 114 Defibrillation and Pacing Problems (Continued)

Symptom	Possible Cause	Potential Solution
Select Therapy Cable Type message.	The device can't detect the type of Therapy cable attached.	Select the proper Therapy cable from the list presented.
Therapy Not Available Due to Disabled Equipment message	A device failure has occurred.	Run operational check to diagnose the problem. If the device is in use at the time of the message, begin CPR if indicated.
Pacing Stopped. Power Interrupted. technical alarm.	Appears after power is restored to indicate there was a loss of power during pacing.	Pacing does not restart automatically. If indicated, resume pacing.
Pacing Stopped. Pads Off. technical alarm.	Proper pads contact has been lost with the patient.	• Check pads connection with patient. Confirm proper skin prep. • Replace pads if necessary. • Resume pacing.
Pacing Stopped. Device Error. technical alarm.	The HeartStart Intrepid has detected an error which prevents pacing therapy delivery.	Remove the device from use and call for service.
Pacer Output Low technical alarm.	High impedance is causing less current to be delivered to the patient than specified in the output current setting.	Check that pads are applied properly.
Pacing Stopped. Pads Cable Off. technical alarm.	The Therapy cable is disconnected from the device.	• Check all Therapy cable connections. • Replace pads if necessary. • Resume pacing.
Pacing Stopped. Leads Off. technical alarm.	The primary ECG lead has become invalid.	• Check that the monitoring electrodes are applied properly to the patient. • Check cable connections. • Resume pacing.
Shock Aborted prompt but you see a physiological response from the patient and the Shock Counter remains unchanged.	Poor skin contact, pads are not properly connected to the patient. Minimal patient movement is possible in this situation as the defibrillator may deliver a small amount of energy.	• Make sure the pads are applied properly. • Replace pads if necessary.
Therapy Malfunction technical alarm	A device failure which prevented therapy from being delivered has occurred.	• Re-attempt therapy. • If it fails again, the device reboots. Retry. • If it fails for a third time, the message Therapy Disabled: Run Op Check appears. • In an emergency situation, use another device. Run an operational check to clear the error.

NOTE: Once the reason for the Pacing Stopped alarm has been resolved, that part of the alarm message is removed from the display. Press the **[Start Pacing]** soft key to resume pacing and remove the remainder of the alarm from the display.

ECG Problems

Table 115 ECG Problems

Symptom	Possible Cause	Potential Solution
QRS beeper inaudible or beeps do not occur with each QRS complex.	The QRS volume is configured to Off or the setting is too low.	Configure the QRS beeper volume.
	The QRS volume was turned off or set too low through the Volume menu.	Adjust the volume through the Volume menu.
	The amplitude of the QRS complex is too small to detect.	Select a different lead.
Poor ECG signal quality (noisy trace, wandering baselines, etc.) from signal acquired through monitoring electrodes.	The monitoring electrodes are not making proper contact with the patient.	Check that the monitoring electrodes are properly applied. If necessary, prepare the patient's skin and apply new electrodes.
	The monitoring electrodes are out of date or dried out.	Check the date code on the electrodes. Do not open the electrode package until immediately prior to use.
	Radio frequency interference (RFI) is causing artifact.	Relocate or turn off equipment that may be causing RFI. Try repositioning the cables/leads.
	The ECG cable may be faulty.	Run an operational check with the ECG cable and check Leads ECG results. If fails, replace the ECG lead set and trunk cable.
Poor ECG signal quality (noisy trace, wandering baselines, etc.) from signal acquired through pads.	The pads are not making proper contact with the patient.	Ensure proper skin preparation and correct application. If necessary, apply new pads. Paddles are only for a quick look, not long term monitoring.
	The pads are outdated or dried out.	Check the date code on the pads. Do not open the pads package until immediately prior to use.
	Radio Frequency Interference (RFI) is causing artifact.	Relocate or turn off equipment that may be causing RFI. Try repositioning the Therapy cable.
	The Therapy cable may be faulty.	Run an operational check with the Therapy cable and check the ECG results. If the operational check fails, replace the cable.
Signal interference is detected on the secondary patient monitor when the multifunction electrodes of the HeartStart Intrepid are attached to the patient while the HeartStart Intrepid is connected to AC power.	Noisy power line frequency signal is conducted from the multifunction electrodes to the ECG leads of the secondary patient monitor.	Change the AC line filter setting on the secondary patient monitor to filter power line frequency noise. Select the 50 Hz or 60 Hz option according to the power line frequency of your country. If the signal interference persists, unplug the AC power cord from the HeartStart Intrepid and run the HeartStart Intrepid on battery power.

Table 115 **ECG Problems (Continued)**

Symptom	Possible Cause	Potential Solution
When monitoring with pads, there is a dashed line on the display instead of an ECG.	ECG data is not being acquired.	• Confirm that the correct lead is selected. • Check the pads, paddles or ECG cable connection. • Check that the pads, paddles, and monitoring electrodes are properly applied.
The Lead Select button does not respond as expected.	Device is in AED mode.	The Lead Select button is disabled in AED mode. To select a lead, exit AED mode and enter Monitor or Manual Defibrillation mode.
	Pads/paddles cannot be used for the primary ECG in Demand mode pacing.	Exit pacing or choose Fixed mode pacing.
	If a 3-Lead cable is in use or some wires in a 5-Lead cable are disconnected, augmented and V-leads may not be selectable.	Confirm all leads are connected.
Solid flat line: no waveform, no leads, Cannot Analyze ECG alarm	Short in the patient cable or leads.	Run an operational check with the ECG cable. If it fails, run again without the ECG cable. If it passes, replace the cable. If operational check continually fails, remove the device from use and call for service.
Pads Off or Paddles Off technical alarm	The multifunction electrode pads or paddles may be disconnected or not attached securely.	• Check that the pads/paddles are properly applied. If necessary, replace the pads. • Change the ECG in wave sector 1 to a lead derived from monitoring electrodes.
Cannot Analyze ECG technical alarm	ECG data cannot be analyzed. An electrode may be disconnected or the analyzing algorithm cannot analyze the ECG signal.	Check ECG signal quality. If necessary, improve lead position or reduce patient movement.
ECG Equipment Malfunction technical alarm.	A device hardware failure was detected.	Disconnect the ECG cable and perform an operational check. If the Leads ECG test fails, remove the device from use and call for service. If the Leads ECG test passes, replace the ECG cable and perform another operational check.
Pads ECG Equipment Malfunction technical alarm.	A device hardware failure was detected.	Run an operational check. If the Pads/Paddles ECG test fails with Therapy cable, disconnect the Therapy cable from the device when prompted in order for the Pads/Paddles ECG Test to run without the cable connected. If the Pads/Paddles ECG Test passes without the cable connected, replace the Therapy cable. If the test fails, take the device out of use and call for service.
Therapy Disabled: Run Op Check technical alarm.	A device failure has been detected. The device is unable to deliver therapy.	Run an operational check. If fails or the problem persists, take the device out of use and call for service.

Table 115 ECG Problems (Continued)

Symptom	Possible Cause	Potential Solution
Press "I,II.." Button to Select Another ECG Lead message.	The waveform in wave sector 1 is no longer valid and another ECG source is available.	- Check that the monitoring electrodes/pads are properly applied. - Use the Lead Select button to select another lead to monitor.
Lead Wire Off message.	The specified monitoring electrode is off or not making proper contact with the patient.	Check that the monitoring electrodes are properly applied. If necessary, prepare the patient's skin and apply new electrodes.
ECG Noisy Signal low-priority technical alarm.	- Dry or dirty ECG monitoring electrodes. - Poor or intermittent electrode or cable connection. - Interference from poorly grounded instrument near the patient. - Saturated or overloaded ECG signal.	- Clean the site and properly apply electrodes (or apply new electrodes). - Replace electrodes, lead wires, or cables. - Route electrode wires along the limbs and away from other electrical equipment.
Attach/Replace ECG Lead message.	Dry or dirty ECG monitoring electrodes.	- Clean the site and properly apply electrodes (or apply new electrodes). - Replace electrodes, lead wires, or cables.
Check ECG Lead message.	- Poor or intermittent electrode or cable connection. - ECG lead status is unknown.	
Check Limb Leads message.	Two or more limb lead electrodes are off or not making proper contact with the patient.	Check that the limb lead electrodes are properly applied. This message does not display when V and RL are off because the device assumes a 3-Lead cable is attached.

EtCO₂ Problems

Table 116 EtCO₂ Problems

Symptom	Possible Cause	Potential Solution
The numeric value is replaced with a -?-.	The module is warming up.	No action required. As soon as the module has warmed up and there is a detectable breath, the question mark is removed from the display.
	See the remainder of this table for other possible causes.	Check the associated technical alarms and address the problem.
You have a Capnogram but the numeric has a question mark in front of it.	The module is warming up.	No action required. As soon as the module has warmed up, the question mark is removed from the display.

Table 116 EtCO₂ Problems (*Continued*)

Symptom	Possible Cause	Potential Solution
The Capnogram does not appear on the display.	The Capnogram is not configured to be displayed.	Use the Displayed Waves menu to select a wave sector to display the Capnogram.
The Capnogram has a dashed line.	The sampling line is not properly connected	• Check all connections. • Check sampling line for knots, kinks or pinches.
Unable to zero: CO ₂ in the Tube message	There is CO ₂ in the sample line.	Ensure the cannula or airway adapter is disconnected from the patient, then zero again.
CO ₂ Sensor Over Temp technical alarm.	The CO ₂ module is overheated.	Ensure the HeartStart Intrepid is being used within the proper environmental temperature.
EtCO ₂ Power Overload technical alarm	The CO ₂ module is malfunctioning.	Replace the module.
CO ₂ Communication Failure technical alarm	The CO ₂ module cannot communicate with the device.	• Run an operational check. • If persists, call for service.
CO ₂ Zero Required technical alarm.	The CO ₂ module needs to be zeroed.	Zero the module. See “Zeroing the CO₂ Module” on page 136.
CO ₂ Out of Range technical alarm.	The CO ₂ value is out of the measurement range.	
CO ₂ Sensor Warming Up technical alarm.	The module has not reached its proper operating temperature.	No action required. The technical alarm is removed when the module reaches its operating temperature.
CO ₂ Check Line technical alarm.	The sampling line or the water filter assembly is kinked or blocked.	• Check the sampling line for kinks or blockages. • Replace sampling line. • Check and replace water filter assembly if necessary.
CO ₂ Tube Unplugged technical alarm.	Patient interface connections are not properly tightened.	Tighten water filter connection to front panel.
CO ₂ Error technical alarm.	A non-critical error was detected.	Restart device when it is appropriate to do so.

General Problems

Table 117 General Problems

Symptom	Possible Cause	Potential Solution
When turned on, the device displays Therapy Not Available Due to Disabled Equipment . If in AED or Manual Defibrillation mode, Begin CPR, If Needed . is also displayed.	Therapy mode is not available because of a device failure.	- Begin CPR if needed. - Run an operational check. If it fails, or the problem continues, take the device out of use and call for service.
Audio is too low or absent.	The QRS, Voice or Alarms volume is configured to a Very Soft or Off setting.	Use the Volume menu to adjust the volume of the prompt.
	Device's speaker failure	Run an operational check to confirm the speaker is operating.
All Settings Reset To Default Values message.	A total power failure or critical software failure has occurred.	Reset alarms, waveforms, volumes and other settings previously defined for the current patient.
Configuration Error. All Settings Reset to Factory Default Values message.	An error has occurred which corrupted your configuration file.	Reset your Configuration settings to your customized settings.
Critical Device Failure Detected. Service Required. message.	A critical device failure has been detected at startup or during RFU testing. Clinical modes are disabled.	Run an operational check. If it fails or the problem occurs repeatedly, take the device out of use and call for service.
Equipment Disabled: System Failure message.		
Therapy Disabled: Run Op Check message.	A device failure has been detected at startup or during RFU testing. The device is unable to deliver therapy.	
Non-critical Device Failure Detected. Service Required message.	A non-critical device failure has been detected at startup or during RFU testing.	Review error and alarm messages on screen. Call for service.
Pads/Paddle Type Unknown message.	A faulty Therapy cable or the Therapy port.	- When prompted, pick the correct cable type from the menu and press the Smart Select knob. (If you select a wrong cable type in error, unplug and re-plug in the cable.) - Replace the Therapy cable. - If persists, take the device out of use and call for service.
One or more controls do not respond as expected, such as a button or soft key.	A faulty control or connection.	Remove the device from use and call for service.

Table 117 **General Problems (Continued)**

Symptom	Possible Cause	Potential Solution
Trends data is not appearing on the display.	Intrepid might not be in Monitor mode.	Make sure your device is in Monitor mode before attempting to display trends data.
Event Record Limit Reached technical alarm.	The eight hour duration limit for the current event has been reached.	To continue event recording, you need to start a new event by powering the device off for 10 seconds and then turning it back on. Do not perform this function if patient safety is an issue.
Event Storage Error technical alarm.	A non-critical device failure has occurred.	Recording of events and waves has stopped. Restart device when it is appropriate to do so. If the alarm continues, call for service.
USB Error technical alarm.		Restart device when it is appropriate to do so. If the alarm continues, call for service.
Device Temp High technical alarm.	The device's internal temperature is above 65°C (149°F)	Turn the device off and allow to cool. If persists, remove the device from use and call for service.
Device Restarted Due to Error technical alarm.	The previous shutdown was caused by an internal device error.	Run an operational check to diagnose the problem. If the problem persists, remove the device from use and call for service.
Power Equipment Malfunction technical alarm.	A power supply failure has occurred but no critical functions are affected.	
Autotest Failure technical alarm.	One of the Ready For Use tests failed to run to completion at its scheduled interval.	Run an operational check to diagnose the problem. If the problem persists, remove the device from use and call for service.
	The device has been without power for more than one week.	Run an operational check to diagnose the problem. If the problem persists, remove the device from use and call for service.
Non-Critical Device Error technical alarm.	A non-critical software error has occurred.	Restart device when it is appropriate to do so. If the alarm continues, call for service.
Display remains in Monitor mode even when you switch to a different mode. Therapy is disabled.	The Therapy knob has failed Op Check.	Run an operational check to diagnose the problem. If the problem persists, take the device out of use and call for service.
System Failure. Service Required message.	A device failure has been detected at startup or during RFU testing. The device can still monitor and deliver therapy in an emergency.	If the device is not required for use on a patient, take it out of use and call for service.
Autotest Overdue: Run OpCheck message.	Autotest has not been run in over a week, possibly because the device was without power.	Run an operational check.

Table 117 **General Problems (Continued)**

Symptom	Possible Cause	Potential Solution
Autotest Error. Run Op Check message.	The device cannot determine if all subsystems are operational.	Run an operational check.
Device doesn't administer a shock during Weekly Shock Test.	You are using a test plug or paddles during the Weekly Shock Test.	This is normal behavior. A shock is not delivered during a Weekly Shock test using a test plug or paddles.
	You are using a test load during the Weekly Shock test.	Confirm you did the test properly before taking the device out of use and calling for service.

NBP Problems

Table 118 **NBP Problems**

Symptom	Possible Cause	Potential Solution
Measurement cycle doesn't automatically start.	NBP is not configured for automatic measurements.	Check/modify the configuration as needed.
	Automatic measurements are not scheduled for the current patient.	Use the Measurements/Alarms menu to define an automatic schedule of measurements for the current patient.
	The [Start NBP] soft key has not been pressed.	Press the [Start NBP] soft key.
The pump operates but the cuff does not inflate or fails to inflate fully.	Defective cuff.	Replace the cuff.
	Poor connection between the cuff and the HeartStart Intrepid.	Check connections and replace tubing if needed.
NBP measurements appear high/low.	The cuff size is too small/large for the patient.	Use the correct cuff size and take another measurement.
NBP Cuff Not Deflated technical alarm. The NBP numeric value is replaced with a -?-.	The cuff has not fully deflated after 3 minutes.	Remove the cuff from the patient. Release pressure in the cuff (disconnect cuff from tubing). Replace the cuff. If the problem persists, call for service.
NBP Cuff Overpressure technical alarm. The NBP numeric value is replaced with a -?-.	The NBP cuff pressure has exceeded the overpressure safety limit of 300 mmHg / 40 kPa.	The cuff should deflate automatically. If not, remove cuff from patient and deflate. Turn device off to reset the alarm and restart NBP.
NBP Measurement Failed technical alarm. The NBP numeric value is replaced with a -?-.	A measurement value could not be obtained.	Check cuff size and placement.

Table 118 **NBP Problems (Continued)**

Symptom	Possible Cause	Potential Solution
NBP Equipment Malfunction technical alarm.	Faulty NBP hardware.	Call for service. If NBP monitoring is essential to patient care, take the device out of use.
NBP Error technical alarm.	A non-critical device failure has occurred.	
NBP Calibration Overdue technical alarm	NBP module calibration is due.	Call for service.

Power Supply Problems

Table 119 **Power Supply Problems**

Symptom	Possible Cause	Potential Solution
The HeartStart Intrepid does not turn on.	There is no power.	- Check the battery pack. Insert a fully-charged battery. - Connect to AC/DC power.
Low Battery message.	The battery may not have enough remaining charge to provide six 200 J shocks and 10 minutes of pacing or monitoring.	
Shutting Down in 1 min message.	Very low battery and the device is not charging.	
Shutting Down Now message.	Battery charge is depleted and the device is not charging.	
Replace the battery or connect the external power supply message.	Very low battery and may not have enough remaining charge for pacing.	
Short battery life (battery appears to lose charge quickly).	Battery may be nearing its end of life.	Replace the battery.
Replace Battery message.	The battery has reached its end of life.	
Battery Communication Failure technical alarm.	The device is unable to communicate with the battery.	- Connect to AC/DC power. - Insert a fully-charged battery. - If the problem persists, call for service. If battery power is essential to patient care, take the device out of use and call for service.
The power gauge on the side of the battery does not work when you first receive the battery.	Battery was shutdown to prolong its life during shipping.	Insert the battery in a HeartStart Intrepid for about 1 minute to awaken it.
Power Test Failure technical alarm.	The installed battery is unable to charge the device for defibrillation.	- Insert a fully-charged battery. - Run an operational check to diagnose the problem. If persists, take the device out of use and call for service.

Printing Problems

Table 120 Printing Problems

Symptom	Possible Cause	Potential Solution
Paper won't move.	Paper improperly loaded, jammed, or wet.	Reload paper or clear jam. If paper is wet, replace with a fresh, dry roll.
Paper moves and then stops.	Door improperly latched.	Check door latch.
	Paper improperly loaded or jammed.	Reload paper or clear jam.
Paper moves but printing is faint or absent.	Paper roll improperly installed.	Check that the paper is installed correctly.
	Incorrect paper type.	Use only recommended paper type.
	Print head temperature approaching maximum recommended operating temperature.	Wait until the printer cools down to restart printing. If there is a lot of black printed on the paper, check ECG for excessive noise.
Paper moves but print quality is poor or some dots are missing.	Dirty printhead.	Clean the printhead. For information, see “Cleaning the Device Printhead” on page 215.
White line running along paper.		
Loud buzzing or grinding noise.	Print door improperly latched.	Check door latch.
Printer Out Of Paper technical alarm.	The printer has run out of paper.	Reload with new fresh, dry roll of paper.
Printer Door Open technical alarm.	The printer door is not fully closed.	Open the printer door and reclose such that it snaps into place.
Printer Font Unavailable technical alarm.	The required font is unavailable for the currently installed language.	If printing is essential to patient care, take the device out of use and call for service.
Printer Malfunction technical alarm.	The printer is faulty or there is a problem communicating with the printer.	Turn the HeartStart Intrepid off for 15 seconds and then turn it back on. If the problem persists, call for service. If printing is essential to patient care, take the device out of use.
Printer Error technical alarm.	A non-critical device failure has occurred.	Restart device. If the error continues and printing is essential to patient care, take the device out of use and call for service.

SpO₂ Problems

Table 121 SpO₂ Problems

Symptom	Possible Cause	Potential Solution
The SpO ₂ waveform is not displayed.	The sensor is not properly connected or the sensor cable is damaged.	- Check the sensor connection and cable. - Try another sensor.
	The SpO ₂ waveform is not configured to be displayed and there is not an unused wave sector.	Use the Displayed Waves menu to select a wave sector to display the SpO ₂ waveform.
	You are in AED mode and SpO ₂ waveform is not configured to be displayed or SpO ₂ is non-pulsatile.	Configure AED mode to use SpO ₂ .
SpO ₂ Non-Pulsatile technical alarm.	The patient's pulse is absent or too weak to be detected or the sensor has come off.	- Check perfusion at the measurement site. - Check that the sensor is applied properly. - Make sure the sensor site has a pulse. - If the message occurs during an NBP measurement on the same limb, wait until the NBP measurement is finished. - Relocate the sensor to another site with improved circulation. - Try another sensor.
SpO ₂ Erratic technical alarm. The numeric value is replaced with a -?-.	SpO ₂ measurements are erratic.	- Check that the sensor is applied properly. - Make sure the sensor site has a pulse. - Relocate the sensor to another site with improved circulation. - Try another sensor.
SpO ₂ Noisy Signal technical alarm.	Excessive patient movement or electrical interference.	- Minimize patient movement. - Make sure the sensor cable is not positioned too close to power cables.
SpO ₂ Interference technical alarm.	Ambient light is too high.	- Cover the sensor with an opaque material to minimize ambient light. - Make sure the sensor cable is not positioned too close to power cables. - Make sure that the sensor cable is not damaged.
SpO ₂ Unplugged technical alarm.	The sensor is not connected.	- Check the SpO₂ connection. - Try another sensor.
	There is too much interference.	
	The sensor is damaged.	
SpO ₂ Sensor Malfunction technical alarm.	The SpO ₂ sensor or cable is faulty.	- Try another sensor. - If the problem persists, call for service of the SpO₂ module. If SpO₂ monitoring is essential to patient care, take the device out of use.
SpO ₂ Equipment Malfunction technical alarm.	Faulty SpO ₂ hardware.	Call for service of the SpO ₂ module. If SpO ₂ monitoring is essential to patient care, take the device out of use.

Table 121 **SpO₂ Problems (Continued)**

Symptom	Possible Cause	Potential Solution
SpO ₂ Extended Update technical alarm. The numeric value is replaced with a -?-.	An NBP measurement or an excessively noisy signal is delaying display/update of the SpO ₂ measurement for more than 30 seconds.	• Wait until the NBP measurement is complete. • Try another sensor site. • Move sensor to a different limb than the NBP cuff.
SpO ₂ Low Perfusion technical alarm. The numeric value is replaced with a -?-.	The SpO ₂ signal is too low to give an accurate reading.	• Check that the sensor is applied properly. • Make sure the sensor site has a pulse. • Relocate the sensor to another site with improved circulation. • Try another sensor.
SpO ₂ Error technical alarm.	A non-critical device failure has occurred.	Restart device when it is appropriate to do so. If the problem persists, call for service of the SpO ₂ module. If SpO ₂ monitoring is essential to patient care, take the device out of use.

TBI Advisory Problems

Table 122 **TBI Advisory Problems**

Symptom	Possible Cause	Potential Solution
The [Enable TBI] soft key does not appear.	The device is not in Monitor mode or is in 12-lead ECG mode.	Switch the device to Monitor mode or exit 12-lead ECG mode.
	The device is not equipped with either SpO ₂ , NBP or EtCO ₂ .	The TBI Advisory is only available on devices configured with SpO ₂ , NBP and EtCO ₂ measurement parameters and all three parameters must be in use.
	TBI Limits have not been configured on the device.	In Configuration mode, set the TBI limits for SpO ₂ , SBP and EtCO ₂ .
The TBI Advisory bar is blocked by another message.	If a physiological alarm condition occurs, it will have a higher priority than the TBI Advisory and will obscure the TBI Indicator.	Attend to the patient and address the alarm condition.

Temperature Monitoring Problems

Table 123 Temperature Monitoring Problems

Symptom	Possible Cause	Possible Solution
<Temperature Label> Equip Malfunction INOP	There has been a malfunction in the temperature hardware.	Contact service.
<Temperature Label> Overrange INOP	The temperature value is outside the measurement range of the device (<0°C or > 45°C).	Check that the temperature probe is on the list of supported accessories. Try changing the application site.
<Temperature Label> Unplugged INOP	The temperature transducer is faulty or has been disconnected from the device.	Try unplugging and then replugging the temperature transducer. If the symptom does not go away, use a different transducer.
Temperature Label = one of the labels which can be applied to a temperature measurement.		

USB Problems

Table 124 USB Problems

Symptom	Possible Cause	Potential Solution
Insert Compatible USB Device message.	A non-compatible USB device has been inserted in the USB port.	Use only a compatible USB device to store data from the HeartStart Intrepid.
You can not save data to the USB flash drive.	The USB flash drive is full.	Delete or remove files from the flash drive to free up space or use a different flash drive.
You can not import a configuration file from the USB flash drive.	The flash drive does not contain a configuration file.	Save a new configuration file to the flash drive and retry.
USB Flash Drive Error message.	The USB flash drive was removed during data transfer.	Re-insert the USB flash drive and retry.
Error Reading Configuration Data message.	The configuration file has become corrupted.	Save a new configuration file to the flash drive and retry.
USB Power Overload technical alarm.	A USB power overload has been detected at the USB port.	Turn the device off for 15 seconds. Replace the USB device. If the problem also occurs with a second USB device, call for service.
Setting Not Supported technical alarm.	The configuration file being imported contains an item that is not compatible with the device's current software version.	The configuration item in question is ignored. If this item is critical to your device, re-export a new configuration file from a device with a similar software revision and retry.

Servicing the HeartStart Intrepid

For product support, contact your local Philips Customer Care Solutions Center or local Philips representative.

Calling for Service

To download the latest documentation, visit the following web site:

<https://philips.mizecx.com>

For product support, contact the local Philips representative.

Before calling for service, note the following information:

- Serial number of the HeartStart Intrepid
- Problem description
- Data from operational check logs, error logs, and so on

NOTES

[illegible]

Docking Station

This chapter provides information about installing and using the HeartStart Intrepid docking station (part number 989803217191).

This chapter is divided into the following sections:

 Docking Station Part List	p. 245
 Installing the Docking Station on an Ambulance Shelf	p. 246
 Removing the Docking Station from an Ambulance Shelf	p. 248
 Attaching the Intrepid to the Docking Station	p. 248
 Detaching the Intrepid from the Docking Station	p. 251

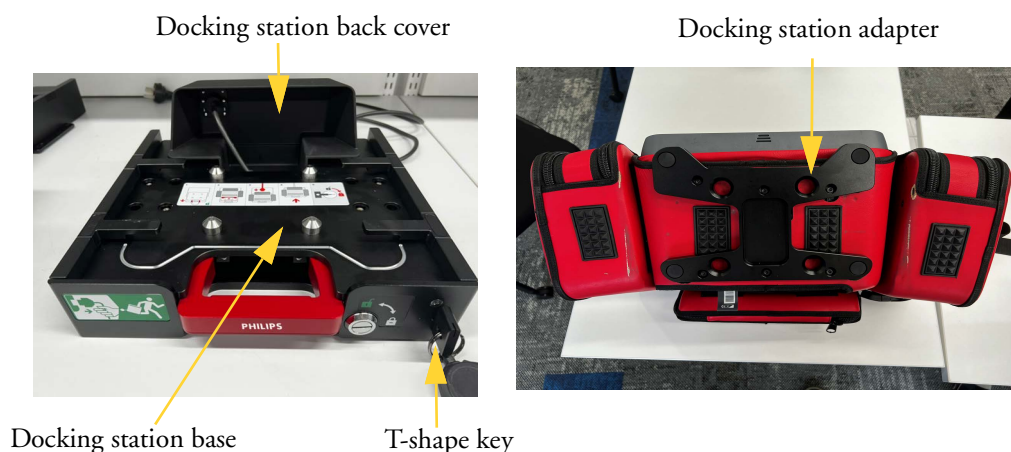
Docking Station Part List

Table 125 lists the parts and tools included in the docking station package.

Table 125 **Docking Station Part List**

Description	Quantity
Docking station base	1
Assorted screws and washers pack	1
Docking station adapter	1
T-shape key	1
Hex screwdriver	1

Figure 75 **Docking Station Overview**



Installing the Docking Station on an Ambulance Shelf

Reserve adequate space on the shelf of the ground or road ambulance before installing the docking station. Ensure there is enough depth on the shelf when the docking station is fully extended. Drill pilot holes in the ambulance shelf if necessary. See [Figure 76](#) for the dimensions of the docking station and [Figure 77](#) for the positions of the mounting screw holes.

WARNING: The docking station must be installed by an equipment technician. Connect and verify that the docking station is connected to a protective ground.

Figure 76 Docking Station Dimensions

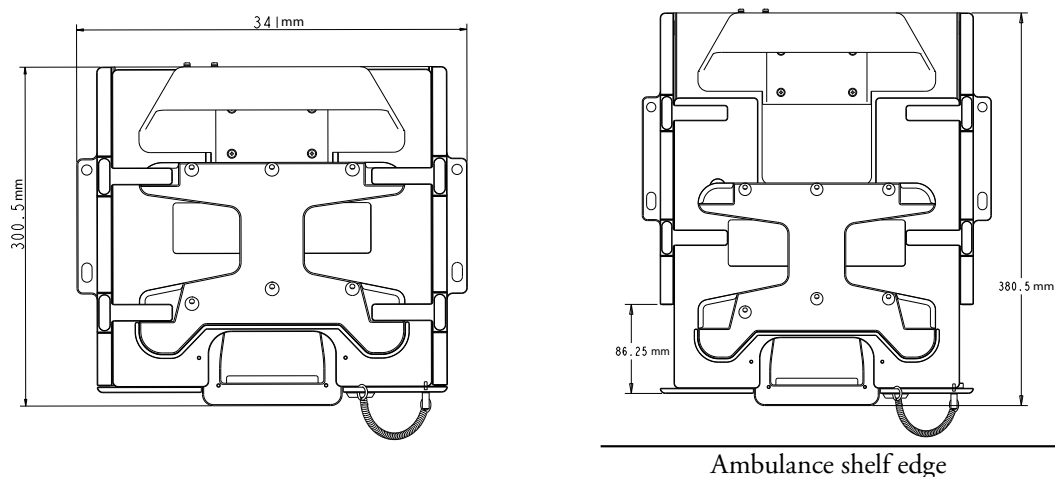
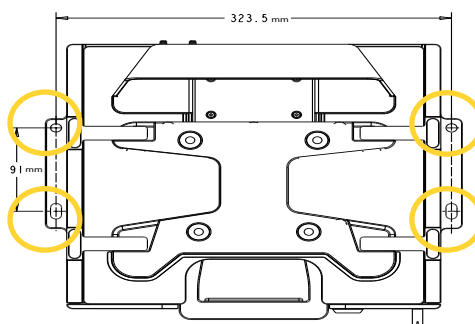


Figure 77 Mounting Screw Holes



[Table 126](#) lists the docking station dimensions and spacing of the mounting screws.

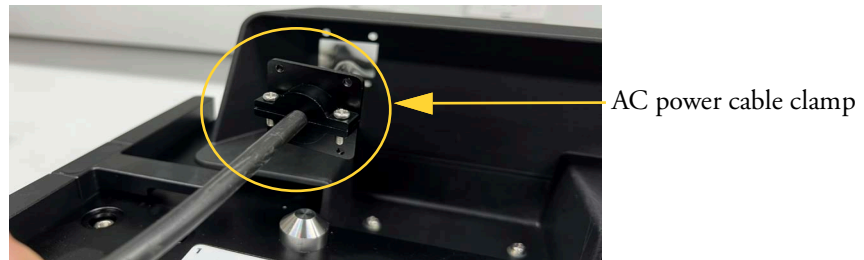
Table 126 Docking Station Dimensions and Mounting Screw Spacing

Description	Measurement
Dimension of the docking station	341.0 mm × 300.5 mm
Mounting screw holes	323.5 mm × 91.0 mm

☉ To install the docking station:

- 1 Pull the AC power cable through the opening on the docking station base. Attach the AC power cable clamber to the AC power cable. Do not tighten the grip of the AC power cable clamp on the AC power cable yet. See [Figure 78](#).

Figure 78 AC Power Cable Clamp



- 2 Continue pulling the AC power cable through the opening. Reserve at least 10 cm (4 inches) of cable length from the entry point of the AC power cable clamp to the power cable plug.

NOTE: Regularly check for signs of the AC power cable obstruction in the back cover area. Adjust the length of the AC power cable if necessary.

- 3 Ensure the AC plug is positioned with the single pinhole on top. See [Figure 79](#).

Figure 79 AC Plug Orientation



- 4 Tighten the grip of the AC power clamp to the AC power cable and mount the AC power clamp to the docking station back cover.
- 5 Place the docking station base on the ambulance shelf; securely fix the docking station base on the ambulance shelf by installing the four M8×25 screws into the pilot holes. See [Figure 77](#) for the location of the M8×25 screw holes.
- 6 Mount the docking station adapter to the bottom of the HeartStart Intrepid:

NOTE: If the HeartStart Intrepid includes the carry bags, you must install the carry bags before mounting the HeartStart Intrepid onto the docking station adapter. For more information about how to install the carry bags, see the *HeartStart Intrepid Instructions for Use*.

- a Align the docking station adapter with the screw holes on the bottom of the HeartStart Intrepid. See [Figure 80](#).
- b Place the washers onto the screw holes on the back of the docking station adapter.
- c Insert and tighten the screws to firmly attach the docking station adapter to the HeartStart Intrepid.

Figure 80 Mounting the Docking Station Adapter



Removing the Docking Station from an Ambulance Shelf

- ◎ To remove the docking station from the ambulance shelf:
 - 1 On the docking station back cover, loosen the six screws of the AC power clamp. Retract the AC power cable from the opening. Mount the AC power clamp back to the docking station back cover for future use.
 - 2 Loosen the four screws on the docking station base. Detach the docking station from the ambulance self.

Attaching the Intrepid to the Docking Station

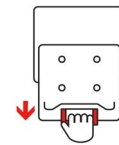
- ◎ To attach the HeartStart Intrepid to the docking station:
 - 1 Ensure that the docking station is unlocked by checking the lock status on the bottom right corner of the front panel. To unlock the docking station, insert the T-shape key into the keyhole and rotate counterclockwise. See [Figure 81](#).

Figure 81 Unlocking the Docking Station



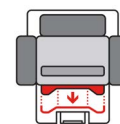
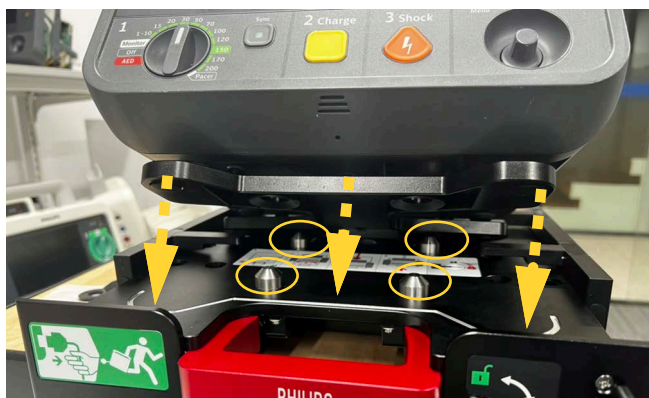
- 2 Hold and pull the latch on the red handle to fully extend the mounting base of the docking station. See [Figure 82](#).

Figure 82 Pulling the Latch



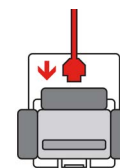
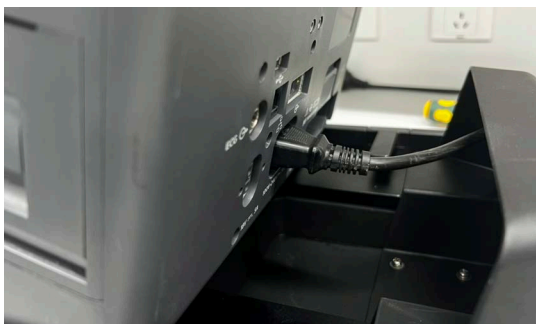
- 3 Place the HeartStart Intrepid into the base of the docking station, aligning the docking station adapter with the outline on the docking station. Ensure that the four guiding pins on the docking station engage the docking station adapter. See [Figure 83](#).

Figure 83 Mounting the HeartStart Intrepid



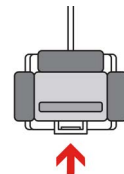
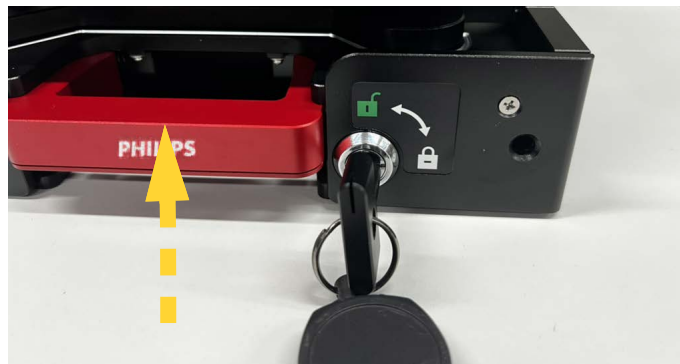
- 4 Plug the AC power cable plug into the AC connection of the HeartStart Intrepid. See [Figure 84](#).

Figure 84 AC Connection



- 5 Hold the latch on the red handle and push the docking station base inwards until you hear a click. See [Figure 85](#).

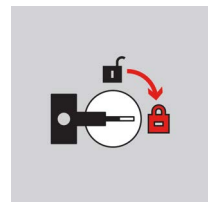
Figure 85 Pushing the Handle



- 6 Insert the T-shape key into the keyhole and turn the key clockwise to lock the docking station. See [Figure 86](#).

NOTE: Remember to plug the T-shape key back to its original position after locking the docking station.

Figure 86 Locking the Docking Station



Detaching the Intrepid from the Docking Station

- © To detach the HeartStart Intrepid from the docking station:
- 1 Insert the T-shape key into the keyhole and turn the key counterclockwise to unlock the docking station. See [Figure 87](#).

Figure 87 **Unlocking the Docking Station**



- 2 Hold and pull the latch on the red handle to fully extend the docking station mounting base. See [Figure 88](#).

Figure 88 **Pulling the Latch**



- 3 Disconnect the AC power cable from the AC connection of the HeartStart Intrepid. See [Figure 89](#).

Figure 89 **Disconnecting the AC Power Cable**



NOTE: You must disconnect the AC power cable before lifting the HeartStart Intrepid from the docking station.

- 4 Lift the HeartStart Intrepid from the docking station.
- 5 Hold the latch on the red handle and push the docking station mounting base inwards until you hear a click.
- 6 Insert the T-shape key into the keyhole and turn the key clockwise to lock the docking station.

Specifications and Safety

General

Approximate dimensions: 24.6 cm (H) x 29 cm (W) x 21 cm (D);
9.7 in (H) x 11.4 in (W) x 8.3 in (D)

Approximate weight: with pads cable, battery, and full roll of paper ≤ 7.0 kg (15.4 lb)

Power: – Rechargeable lithium ion battery
– AC power, input from a grounded electrical outlet
– DC power, using the DC power module

Device service life: Seven years

Mode of operation: Continuous operation equipment

AC line powered: 100 – 240 VAC, 50 or 60 Hz, 1.8 – 0.75 A, Class I equipment

DC line powered: With the DC Power Module (Input: 10-32 VDC, 11A maximum. Output: 18 VDC, 5A maximum), Class II equipment

Battery powered: Nominal voltage 14.68 V

Alarms

The HeartStart Intrepid alarms comply with IEC 60601-1-8/YY 0709-2009.

Defibrillator

Waveform: Biphasic Truncated Exponential. Waveform parameters adjusted as a function of patient impedance.

Table 127 Delivered Energy Accuracy

Nominal Delivered Energy vs. Load Impedance								
Selected Energy	Load Impedance (ohm) ±2%							
	15	25	50	75	100	125	150	175
1 J	1.0	1.2	1.3	1.3	1.2	1.1	1.0	0.9
2 J	1.5	1.7	2.0	2.1	2.0	1.9	1.7	1.6
3 J	2.2	2.6	3.0	3.1	3.2	3.2	3.1	2.9
4 J	3.0	3.5	4.0	4.2	4.3	4.4	4.5	4.3
5 J	3.7	4.3	5.0	5.2	5.4	5.5	5.6	5.4
6 J	4.5	5.2	6.0	6.3	6.5	6.6	6.7	6.5
7 J	5.2	6.1	7.0	7.3	7.6	7.8	7.8	7.6

Table 127 **Delivered Energy Accuracy (Continued)**

Nominal Delivered Energy vs. Load Impedance								
Selected Energy	Load Impedance (ohm) $\pm 2\%$							
	15	25	50	75	100	125	150	175
8 J	5.9	6.9	8.0	8.4	8.6	8.9	8.9	8.7
9 J	6.7	7.8	9.0	9.4	9.7	10	10	9.8
10 J	7.4	8.7	10	10	11	11	11	11
15 J	11	13	15	16	16	17	17	16
20 J	15	17	20	21	22	22	22	22
30 J	22	26	30	31	32	33	33	33
50 J	37	43	50	52	54	55	56	54
70 J	N/A	61	70	73	76	78	78	76
100 J	N/A	87	100	105	108	111	111	108
120 J	N/A	104	120	126	130	133	134	130
150 J	N/A	130	150	157	162	166	167	163
170 J	N/A	147	170	178	184	188	189	184
200 J	N/A	173	200	209	216	222	223	217

The delivered energy accuracy is $\pm 10\%$ or ± 1 J, whichever is greater, for all energy settings.

Fifteen ohms load impedance is for internal paddles defibrillation only; therefore data is not available for nominal delivered energy over 50 J.

Charge Times

- Less than 5 seconds to the recommended adult energy level (150 J) with a new fully-charged battery installed.
- Less than 6 seconds to the selected energy level (up to 200 J) with a new fully-charged battery installed, even after the delivery of 15 discharges at maximum energy.
- Less than 10 seconds to the selected energy level while connected to AC/DC power only, even when operating on 90% of the rated mains voltage.

The device powers on in manual defibrillation mode ready to deliver shock in less than:

- 19 seconds with AC/DC power only, even when operating on 90% of the rated mains voltage.
- 19 seconds with a new, fully-charged battery even after 15 discharges of maximum energy.

Time from the initiation of analysis in AED mode until ready to deliver shock is less than:

- 14 seconds with AC/DC power only, even when operating on 90% of the rated mains voltage.
- 12 seconds with a new, fully charged battery even after 15 discharges of maximum energy.

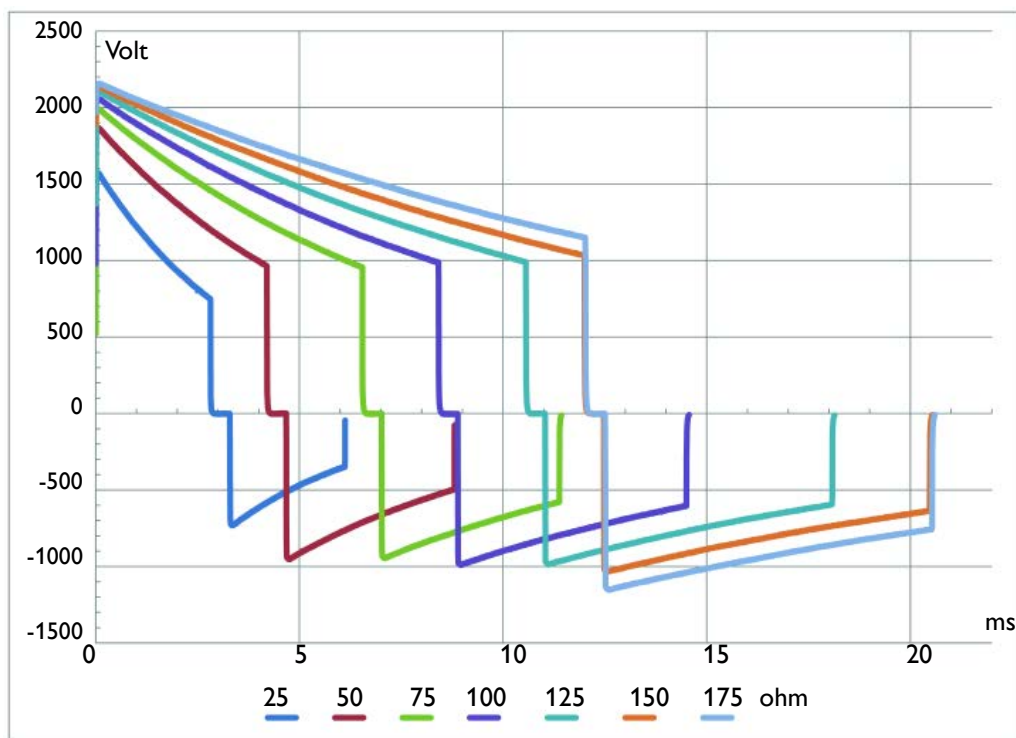
The device powers on in AED mode ready to deliver shock in less than:

- 26 seconds with AC/DC power only and at 90% of rated mains voltage.
- 23 seconds with a new, fully charged battery even after 15 discharges of maximum energy.

Patient Impedance Range

- Minimum: 25 ohm (external defibrillation); 15 ohm (internal defibrillation);
- Maximum: 250 ohm. Actual functional range may exceed these values.

Figure 90 **SMART Biphasic Waveform**



Manual Defibrillation Mode

Manual output energy (selected): 1-10, 15, 20, 30, 50, 70, 100, 120, 150, 170, 200 Joules; maximum energy limited to 50 J with internal paddles.

Synchronized shock timing: Maximum time from R-Wave detected to shock delivered is 25 ms, as measured with oscilloscope from peak of input QRS wave to leading edge of defibrillation discharge into a 50 ohm test load.

AED Mode

AED energy profile: 150 Joules (factory default) for Adult / 50 J for Infant/Child nominal into a 50 ohm test load.

ECG and Arrhythmia Monitoring

Inputs: Up to four ECG waves may be viewed on the display and up to three waves printed simultaneously.

Heart rate display: Digital readout on the display from 16 to 300 bpm (Adult) or 16 to 350 bpm (Infant/Child), with an accuracy of $\pm 10\%$ or ± 5 bpm, whichever is greater.

Heart Rate/Arrhythmia Alarms: HR high, HR low, Asystole, VFib/V-Tach, Vtach, Extreme Tachy, Extreme Brady, PVC rate, Pacer Not Capture, Pacer Not Pace.

Common mode rejection: 105 dB for Leads ECG, 96 dB for pads ECG.

ECG size: 1/4x, 1/2x, 1x, 2x, 4x, auto gain (1x gain is 10 mm/mV on the printed strip).

ECG waveforms: Displayed at a fixed timebase:

- Printer: 25 or 50 mm/sec $\pm 5\%$
- Display: 25 mm/sec $\pm 5\%$

ECG Waveform Recovery Time: Less than or equal to three seconds after defibrillation.

ECG leads off sensing: 3-, 5-, and 10-Lead wires apply a <35 nA DC current patient electrodes, <1.0 μ A other electrodes.

Maximum T-Wave amplitude: Device rejects up to 80% of R-Wave amplitude for synchronized cardioversion; up to 55% of R-Wave amplitude for demand pacing; up to 34% of R-Wave amplitude for arrhythmia analysis. Maximum T-Wave amplitude when a QRS test signal is 1 mV amplitude and 100 ms duration, with a heart rate of 80 bpm used: 1.8 mV.

Frequency response:

- ECG AC line filter: 50 Hz or 60 Hz.
- ECG for display:
 - 0.15-40 Hz
 - 0.05-40 Hz (IEC 60601-2-27)
 - 2.0-20.0 Hz
- ECG for printer:
 - 0.05-150 Hz – Diagnostic
 - 0.15-40 Hz – Monitor
 - 0.05-40 Hz – ST Monitor (IEC 60601-2-27)
 - 2.0-20.0 Hz – EMS

Heart rate accuracy and response to irregular rhythm: Meets IEC standard for ventricular bigeminy (HR=80 bpm); slow alternating ventricular bigeminy (HR=60 bpm); rapid alternating ventricular bigeminy (HR=120 bpm); bidirectional systoles (HR=90 bpm) as measured after a 20 sec stabilization time.

ECG analog output bandwidth: 0.5 to 70 Hz

ECG analog output gain: 1 V output per 1 mV input $\pm 10\%$

ECG analog output delay: Propagation delay time is <25 ms from ECG input to ECG analog output.

Pacemaker pulse rejection capability: Rejects pacemaker pulses with amplitudes from ± 2 mV to ± 700 mV and pulse widths from 0.1 ms to 2.0 ms without overshoot as per IEC 60601-2-27/GB 9706.25-2005/YY 1079-2008.

Pacer pulse detector rejection of fast ECG signals: Slew Rate no less than 1.1 V/s.

Response Time to Heart Rate Change: 7 seconds for a High Heart Rate alarm when the rate changes from 80 to 120 bpm, with the alarm limit set at 100 bpm; 6 seconds for a Low Heart Rate alarm when the rate changes from 80 to 40 bpm, with the alarm limit set at 60 bpm.

Time to alarm for tachycardia: 4 sec for 206 bpm (1 mV, halved amplitude and double amplitude) and 195 bpm (2 mV, halved amplitude and double amplitude) as measured following a normal 80 bpm rate with upper alarm limit set at 100 and lower alarm limit set at 60 bpm.

Patient isolation (defibrillation proof):

- Lead ECG: Type CF
- CO₂: Type BF
- Pads/Paddles: Type BF
- Temperature: Type CF
- SpO₂: Type CF
- NBP: Type CF
- Internal Paddles: Type CF
- CPR meter 2: Type BF

Display

Size: Approximately 21.3 cm (8.4 in) diagonal viewing area.

Type: Color TFT LCD.

Resolution: 1024 x 768 pixels (XGA) with 32 brightness levels per color.

Sweep speed: 25 mm/s $\pm$ 10% nominal (stationary trace; sweeping erase bar) for ECG and SpO₂; capnogram wave is 6.25 mm/s $\pm$ 10%.

Wave viewing time: 5.0 sec $\pm$ 10%.

Battery

Type: Rechargeable, Lithium Ion; See battery label for capacity information.

Approximate dimensions: 27.9 mm (H) x 81 mm (W) x 146.7 mm (L); 1.1 in (H) x 3.2 in (W) x 5.8 in (L)

Approximate weight: Approximately 0.5 kg (1 lb)

Capacity: With a new fully charged battery, at 20°C (68°F), one of the following:

- 100 full-energy charge/shock cycles.
- Five hours of monitoring (ECG, EtCO₂, SpO₂, and Temperature continuously monitored and NBP sampled every 15 minutes) followed by 20 full-energy charge/shock cycles.
- Three hours of pacing (180 ppm at 140 mA with 40 msec pulse) and monitoring (ECG, EtCO₂, SpO₂, and Temperature continuously monitored and NBP sampled every 15 minutes).

Charge time with device turned off and AC power connected: With temperature at 25°C (77°F):

- Less than 3 hours to 100% capacity
- Less than 2.5 hours to 90% capacity
- Less than 2 hours to 80% capacity

Temperature

Measurement range: 0°–45°C (32°–113°F)

Measurement resolution: 0.1°C (0.2°F)

Measurement accuracy (excluding any adapter cable):

- $\pm$ 0.1°C from 25°C to 45°C
- $\pm$ 0.3°C from 0°C to 24.9°C
- temperature probe adds an additional $\pm$ 0.1°C

NOTE: If operating under conditions according to the EMC standard IEC 60601-1-2/YY 0505-2012 (Radiated Immunity 3 V/m or Conducted Immunity 3 VRMS), the additional temperature error is $\leq \pm 0.1^{\circ}\text{C}$.

Settling time constant: <10 seconds

Alarm signal generation delay time: less than 7 seconds

Minimum measurement time: See the probe's Instructions for Use to obtain minimum measurement times for accurate readings. The HeartStart Intrepid does not add any clinically significant time to obtain accurate readings.

Mode of operation: Direct mode

Transient response time from 25°C to 27°C: <60 seconds

Transient response time from 25°C to 23°C: <60 seconds

Thermal Array Printer

The following reports can be printed:

- Event Summary (Long or Short)
- Trends
- Operational Check
- Configuration
- Error Log
- Device Information
- 12-lead

Speed: 25 or 50 mm/s with an accuracy of $\pm 5\%$

Paper size: 75mm (W) x 30 m (L)

Noninvasive Pacing

Waveform: Monophasic

Current pulse amplitude: 10 mA to 200 mA if the pulse width is set to 20 ms (5 mA increments); accuracy $\pm 10\%$ or ± 5 mA whichever is greater. For a 40 ms setting, the maximum pacing current is 140 mA.

Pulse duration: 20 or 40 msec with $\pm 10\%$ accuracy

Rate: 30 ppm to 180 ppm (10 ppm increments); accuracy $\pm 1.5\%$

Mode: Demand or Fixed

Refractory period: 340 msec (30 to 80ppm); 240 msec (90 to 180 ppm) $\pm 10\%$

Universal-function electrodes (pads): After 60 minutes of pacing with approved defibrillators, the Multifunction Electrodes (Pads) exhibit a post-defibrillation DC Offset of less than ± 800 mV at ≥ 4 seconds post-shock.

SpO₂ Pulse Oximetry

SpO₂ measurement range: 0-100%

SpO₂ resolution: 1%

SpO₂ update period: 1-2 seconds typical; maximum of 30 seconds or less

SpO₂ sensor accuracy: Specified accuracy is the root-mean-square (RMS) difference between the measured values and reference values.

Table 128 SpO₂ Sensor Accuracy

Part Number	Sensor Accuracy
989803205381	±3%
989803205391	±3%
989803205831	±3%
989803205841	±2%
989803205851	±2%
989803205861	±2%
989803205901	±3%
M1191B	±2%
M1191BL	±2%
989803205871	±2%
989803205891	±3%

NOTES: Accuracy outside the range specified for each sensor is not indicated. The above referenced sensors were validated for use with the HeartStart Intrepid using the Philips picoSAT II SpO₂ module with Fourier Artifact Suppression Technology (FAST).

Interference from fluorescent light is <2% SpO₂ under the following conditions: between 0.3% and 1% perfusion, 50 nA/mA transmission, 10 to 1000 lx light intensity, 50/60±0.5 Hz power line frequency.

While the SpO₂ module is able to report values below 70% and alarm limits can be set below 70%, the accuracy of measurements less than 70% has not been validated.

SpO₂ accuracy was validated in human studies against arterial blood sample references measured with a CO-oximeter. In a controlled desaturation study, healthy adult volunteers with saturation levels between 70-100% SaO₂ were studied. The population characteristics for those studies were approximately 50% male and 50% female, ranging in age from 19-39 with skin tone from light to dark.

Pulse oximetry equipment measurements are statistically distributed, therefore only two-thirds of pulse oximeter equipment measurements can be expected to fall within ±Arms of the value measured by a CO-oximeter.

Functional test equipment designed for SpO₂ testing cannot be used to assess the accuracy of the SpO₂ readings.

See the sensor's instructions for use for the maximum temperature possible at the sensor-skin interface and other information such as intended patient population, sensor application sites and use criteria.

The HeartStart Intrepid is calibrated to display functional oxygen saturation.

SpO₂ alarm range:

- Low limit: 50-99% (Adult and Infant/Child)
- High limit: 51-100% (Adult and Infant/Child)

SpO₂ and pulse high/low alarm signal generation delay: Less than 12 seconds

SpO₂ response time (90 to 80%): Less than 22 seconds

SpO₂ and pulse averaging time: 10 seconds

Emitted light energy: ≤15 mW

Wavelength range: 500-1000 nm (Information about wavelength range can be useful to users, especially those performing photodynamic therapy.)

Desat alarm signal generation delay: Less than 21 seconds

Pulse rate measurement range: 30-300 bpm

Pulse rate resolution: 1 bpm

Pulse rate accuracy: ±2% or 1 bpm whichever is greater

Pulse rate reference method: Electronic pulse simulator

Pulse response time (90 to 120 bpm): Less than 22 seconds

Pulse alarm range:

- Low limit: 30-295 bpm (Adult and Infant/Child)
- High limit: 35-300 bpm (Adult and Infant/Child)

EtCO₂

Range: 0, 5 to 99 mmHg (0.7 to 13.1 kPa) at sea level

Resolution: 1 mmHg (0.1 kPa)

Total system response time: < 4 seconds, includes transport time and rise time with water filter assembly and airway adapter. Up to an additional 3 seconds for sidestream sampling cannulas with dehumidification and extension tubing.

Time to zero: Maximum 30 seconds.

Sample flow rate: 50 ml/minute ± 10 ml/minute.

EtCO₂ Stability

Short term drift: Drift over 6 hours does not exceed 0.8 mmHg.

CO₂ Accuracy

- For values between 0 and 38 mmHg: ± 2 mmHg of the actual value.
- For values between 39 and 99 mmHg: $\pm 10\%$ of the actual value.
- For breath rates values, see the following table:

Range	0 to 40 Breaths Per Minute	41 to 70 Breaths Per Minute	71 to 80 Breaths Per Minute	81-100 Breaths Per Minute
0 to 38 mmHg	3mm Hg, -4mm Hg	3mm Hg, -(2mm Hg+6% of the actual value)	3mm Hg, -(2mm Hg+14% of the actual value)	(1mm Hg+12% of the actual value), -26% of the actual value
39 to 99 mmHg	(1mm Hg+10% of the actual value), -(2mm Hg+10% of the actual value)	(1mm Hg+10% of the actual value), -16% of the actual value	(1mm Hg+10% of the actual value), -24% of the actual value	

Alarm range:

- Low limit: 10 to 95 mmHg (1.3 - 12.7 kPa) (Adult/Infant-Child)
- High limit: 20 to 99 mmHg (2.7 - 13.2 kPa) (Adult/Infant-Child)

AwRR

Range: 0, 2 –100 rpm

Resolution: 1 rpm

Accuracy: ± 1 rpm

Alarm Range:

- Low limit: 0 to 99 rpm (Adult, Infant/Child)
- High limit: 10–100 rpm (Adult, Infant/Child)

Alarm signal generation delay time: (after alarm condition has been met): less than 2 seconds

NBP

Table 129 Pressure Range

Measurement	mmHg		kPa	
	Adult	Infant/Child	Adult	Infant/Child
Systolic	30–270	30–130	4.0–36.0	4.0–17.3
Diastolic	10–245	10–100	1.3–32.7	1.3–13.3
Mean	20–255	20–120	2.7–34.0	2.7–16.0

Initial pressure: 165 mmHg/22 kPa (Adult); 130 mmHg/17.3 kPa (Infant/Child)

Overpressure limit: 300 mmHg/40 kPa (Adult); 150 mmHg/20 kPa (Infant/Child)

Cuff inflation time: Typical for normal adult cuff (250 ml, 160 mmHg): Less than 10 seconds

Clinical accuracy: Investigated according to the requirements of ISO 81060-2/YY 0667-2008 and YY 0670-2008

Cuff pressure range: (0 to 300 mmHg): ± 3 mmHg.

Table 130 Alarm Range

Measurement	mmHg		kPa	
	Adult	Infant/Child	Adult	Infant/Child
Systolic high limit	35-270	35-130	4.5-36.0	4.5-17.0
Systolic low limit	30-265	30-125	4.0-35.0	4.0-16.5
Diastolic high limit	15-245	15-100	2.0-32.5	2.0-13
Diastolic low limit	10-240	10-95	1.5-32.0	1.5-12.5
Mean high limit	25-255	25-120	3.5-34.0	3.5-16.0
Mean low limit	20-250	20-115	3.0-33.0	3.0-15.0

Auto mode repetition time: 1, 2.5, 5, 10, 15, 30, 60, or 120 min

NBP maximum inflation time:

- Adult: 180 seconds
- Infant/Child: 90 seconds

Alarm delay time from completion of measurement: < 2 seconds

Patient Data Storage

Event Summary : The HeartStart Intrepid can store up to 8 hours of 2 continuous ECG waves, 1 pleth wave, 1 capnogram wave, research waves (AED mode only) events and trends data per event summary. There is a maximum capacity of approximately 80 event summaries of approximately 30 minutes in length.

Environmental

Temperature:

- Operating temperature range for the device: 0 °C to 45°C (32°F to 113°F).
- Operating temperature range for EtCO₂ monitoring: 0 °C to 40°C (32°F to 104°F).
- Storage/transport range for the device without battery: -20°C to 70°C (-4°F to 158°F).

Relative Humidity: 15% to 95%, non-condensing.

Atmospheric pressure range (operation and storage): 1060 mbar to 572 mbar (-382 m to 4568 m; -1250 ft to 15,000 ft).

Transient operating conditions: The HeartStart Intrepid can operate for a period not less than 20 minutes in the following conditions:

- Temperature: -20°C (-4°F) to 50°C (122°F)
- Relative humidity: 15% to 90%, non-condensing

Free fall: IEC 60068-2-32/GB 2423.8 Free Fall. Total 6 faces (excluding bedrail hook).

- 40 cm (16 in) without carry bags
- 75 cm (29.5 in) with side and rear carry bags, one time on each face
- 50 cm (20 in) with side and rear carry bags, two times on each face

Ingress protection (IP): IP54

Shock

Operating: Half-sine waveform, duration < 11 ms, acceleration 30 g, 3 shocks per face.

Non-operating: Trapezoidal waveform, duration: < 25 ms, acceleration 30 g, velocity change 7.42 m/s ±10%, 1 shock per face.

Vibration:

Operating / Non-Operating Random			Non-Operating Swept Sine	
Frequency (Hz)	Slope (dB/octave)	PSD (g ² /Hz)	Frequency (Hz)	Amplitude
10–100	—	0.052	10–57	± .15 mm
100–200	-7.0	—	57–150	2 g
200–2000	—	0.01	Test duration: 4 sweeps per axis x 3 axes; Each sweep: 10-150-10 Hz cycle at a sweep rate of 1 oct/min	
(Total RMS acceleration 5.1 g RMS)				
Test duration: 30 min/axis x 3 axes = 90 minutes total.				

MIL-STD 810G 514.6: Category 9, non-operating UH60 helicopter, general storage, random and sine. **Test duration:** 4 hours/axis (12 hours total)

Bump: Half-sine, 15 g peak, 6 ms, 1000 hits (vertical with the device in its normal mounting position)

CPR meter 2

Maximum dimensions: 160 mm x 65 mm x 30 mm with an integrated 0.91 m (3 ft) cable

Maximum weight including cable: 300 g (10.6 oz)

Input voltage: 3.9-10.0VDC, max 170 mA. The CPR meter 2 is electrically and galvanically isolated from the defibrillator power and communication sources.

Temperature:

- Operating: 0°C to 50°C (32°F to 122°F)
- Storage: -20°C to 70°C (-4°F to 158°F)
- Transport: -20°C to 70°C (-4°F to 158°F)

Relative humidity, non-condensing:

- Operating: 5% to 95%
- Storage: 5% to 75%
- Transport: 5% to 95%

Ingress protection (IP): IP 55

EMC: Meets IEC 60601-1-2

Relative compression depth range: 0–70 mm, accuracy: $\pm 10\%$ (30–70 mm)

Compression force measurement accuracy: ± 2 kg tolerance at 2.5 kg

Compression rate measurement range: 0–200 cpm, accuracy: ± 3 cpm (100–120 cpm)

Ventilation rate measurement range: 0–60 rpm

Security and Privacy

Network connectivity and functions are independent from other HeartStart Intrepid functions. Network and connectivity-related issues do not affect other Intrepid functions, such as therapy-related functions.

USB functions do not affect therapy-related functions. You cannot access an inserted USB drive while in clinical modes.

Security Controls and Access Controls

Role-based security controls are used to control access to clinical modes, Data Management mode, Configuration mode, and Service mode.

Service mode has the highest level of security and always requires a Service mode password to enter. In Service mode, the Service mode password and the Configuration mode password can be changed.

Configuration mode can be entered to view the configuration settings without a password. To make and save any changes to the configuration settings requires the entry of the Configuration mode password. In Configuration mode, the choice of **Data Management Password Required** can be set to **On** or **Off**.

Data Management mode access is controlled by an optional (as set in Configuration mode) Data Management mode password.

The HeartStart Intrepid is used to provide patient care in emergency situations where time to therapy delivery can be critical and therefore, access to clinical modes is available to clinical users with no password required.

Event Summary Records at Rest and in Transit

All event summary records stored within the device are encrypted and automatically deleted after 30 days. The encryption method is AES-128.

The event summary records are also encrypted when exported to an attached USB drive or transferred over a Wi-Fi or cellular network. Data transfer uses TLS 1.2 encryption.

To help avoid loss of data, Philips recommends that you regularly back up event summary records by exporting them to a USB drive from Data Management mode. The USB drive should be securely stored to prevent loss or unauthorized access to the data or damage to the USB drive.

Device and Access Logs

In Service mode, you can view and manage device and access logs:

- Detailed device information (component versions at the time of export)
- Hardware Error Log
- Software Error Log
- Detailed ECG RFU Log
- Detailed Therapy RFU Log
- Detailed Device Parameter RFU Log
- OpCheck Summary File
- RFU Summary File
- RFU Result Log
- Access Log
- Network Status Log

For more information, see the HeartStart Intrepid *Service Manual*.

Physical Security Recommendations

To protect the device from any unauthorized operation or access, Philips recommends that the owning organization maintain the physical security of the device at all times such that it can only be accessed by authorized personnel.

Software Upgrades

The HeartStart Intrepid complies with the software requirements contained in IEC 62304/YY/T 0664-2020.

Software upgrades for the HeartStart Intrepid are distributed through the Philips Service organization to provide feature upgrades and security patches. All software upgrade files produced by Philips are encrypted to ensure their integrity. A software upgrade can be performed in Service mode which requires the Service mode password for entry.

Philips recommends that customers always keep their HeartStart Intrepid updated with the most recent software release.

If a device is at the end of its service life, Philips cannot support the device with current security and software releases.

Device Disposal

When disposing the device, remove all patient information from the device. For more information, see “HeartStart Intrepid Disposal” on page 216.

Safety Regulations

Safety and EMC Meets IEC 60601:

- IEC 60601-1/GB 9706.1-2007
- IEC 60601-1-2/YY 0505-2012
- IEC 60601-1-8/YY 0709-2009
- IEC 60601-2-4/GB 9706.8-2009
- IEC 60601-2-25/YY 0782-2010
- IEC 60601-2-49/YY 0668-2008
- IEC 60601-1-12
- IEC 60601-2-27/GB 9706.25-2005/YY 1079-2008
- IIEC 80601-2-30/YY 0667-2008 and YY 0670-2008
- ISO 80601:
 - ISO 80601-2-61/YY 0784-2010
 - ISO 80601-2-55/YY 0601-2009
 - ISO 80601-2-56/YY 0785-2010

REACH Regulation and Device Raw Materials

The EU REACH Regulation 1907/2006 requires Philips to provide chemical content information for Substances of Very High Concern (SVHC) if they are present in the relevant article above a concentration of 0.1% weight by weight.

For information on substances contained in Philips products, see www.philips.com/REACH.

Table 131 Device Raw Materials

Pb	Hg	Cd	Cr6+	PBB	PBDE
O	O	O	O	O	O
• = one or more of the device's raw materials has this harmful substance and concentration over the standard concentration limit. O = the raw material concentrations are within allowed limits.					

WARNING: The base material of this product can expose you to chemicals such as lead, which is known to the State of California to cause cancer. For more information, see www.P65Warnings.ca.gov.

Symbol Definitions

The following table lists symbols that may be present on the HeartStart Intrepid, its accessories, or the shipping carton.

Table 132 **Symbol Glossary**

Symbol	Title	Description
	Alternating current	Indicates on the rating plate that the equipment is suitable for alternating current only. Identifies relevant terminals.
CONTIENE  X-00000	Argentina RAMATEL identification information	Identifies the registration number issued by ENACOM for RAMATEL.
	Atmospheric pressure limit	Indicates the acceptable upper and lower limits of atmospheric pressure for transport and storage.
	Batch	Identifies the manufacturer's batch or lot code.
	Battery	Identifies the battery holder or the positioning of the battery itself.
	Cargo aircraft only	Indicates that the item is to be transported on cargo aircraft only, not on passenger aircraft.
 	Caution	Indicates that caution is necessary when operating the device or control close to where the symbol is placed. Indicates that the current situation needs operator awareness or operator action in order to avoid undesirable consequences.
	Caution hot surface	Indicates that the marked item can be hot and should not be touched without taking care.
 	Caution shock	Identifies equipment that has risk of electric shock.
	CE mark with notified body	Indicates European technical conformity.
	Class II equipment	Identifies equipment meeting the safety requirements specified for Class II equipment according to IEC 61140.
	Country of manufacture and date	Identifies the country of manufacture of products: - The "CC" is replaced by the two-letter or three-letter country code defined in ISO 3166-1. - The date is adjacent to the symbol and in YYYY-MM-DD format.
	Dangerous voltage	Indicates hazards arising from dangerous voltages.

Table 132 **Symbol Glossary (Continued)**

Symbol	Title	Description
	Defibrillation-proof type BF applied part	Identifies a defibrillation-proof type body floating (BF) applied part complying with IEC 60601-1/GB 9706.1-2007.
	Defibrillation-proof type CF applied part	Identifies a defibrillation-proof type cardiac floating (CF) applied part complying with IEC 60601-1/GB 9706.1-2007.
	Direct current	Indicates on the rating plate that the equipment is suitable for direct current only. Identifies relevant terminals.
	Do not deform or damage	Indicates that the equipment is to not be deformed or damaged.
	Do not dispose of in fire	Indicates that the equipment is to not be disposed of in fire.
	Do not open or dismantle	Indicates that the equipment is to not be opened or dismantled.
	Do not reuse	Indicates that the item is for single use only and must not be used more than once.
	Do not short circuit	Indicates that the equipment is not to be short circuited.
	EC rep	Identifies the authorized representative in the European community.
	ECG port	Identifies the connecting port for the ECG cable.
	Environmentally friendly use period (EFUP), up to 50 years	Identifies the period during which hazardous substances contained in electrical and electronic products will not result in any of the following under normal operating conditions: • leak or mutate • serious environmental pollution • serious bodily injury to the user • damage to equipment
	European Union	Indicates the European Union.
	Fragile	Indicates that the contents of the transport package are fragile, and the package shall be handled with care.
	Humidity limitation	Identifies the maximum and minimum limits of relative humidity at which the item shall be stored, transported, or used.
	Importer	Identifies the entity importing the medical device into the locale.
IP54/IP55	Ingress protection	Identifies the level of protection offered by an enclosure against solids and liquids.

Table 132 **Symbol Glossary (Continued)**

Symbol	Title	Description
	INMETRO	Indicates compliance with INMETRO regulation and identifies the product certification body (OCP) number.
	Input	Identifies an input terminal.
	Input (entrance)	Identifies an entrance.
	Input/output	Identifies a combined input/output connector.
	Keep away from rain	Indicates that the transport package shall be kept away from rain and in dry conditions.
	Keep away from sunlight	Indicate that the transport package shall not be exposed to sunlight.
	Korea certification	Indicates compliance with Korea's product safety requirements for electrical and electronic equipment.
	LAN port	Identifies the connecting port for the LAN cable. The LAN port is for factory use only.
	Lithium battery	Identifies the lithium battery classification: • UN 3480 indicates lithium ion battery. • UN 3481 indicates lithium ion battery packed with equipment.
	Malaysia MCMC	Indicates product compliance with Malaysian Communications and Multimedia Commission (MCMC). Unique certification number may be included with the symbol.
	Manufacturer	Identifies the manufacturer of a product.
	Mass, weight	Indicates mass or a function related to mass.
	Maximum altitude	Identifies that the product is intended to be usable up to the maximum altitude.
	Model number	Identifies the model number or type number of a product. The model number or type number of the product should be accompanied with this symbol.
	MR Unsafe	Indicates that the product is unsafe to operate under magnetic resonance (MR) environments. Do not enter an MRI scanner room or an MR system.

Table 132 **Symbol Glossary (Continued)**

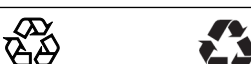
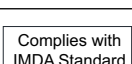
Symbol	Title	Description
	NBP port	Identifies the connecting port for the NBP cable.
	Nominal dimensions	Identifies the control to set or adjust the dimensions. Identifies the nominal dimensions.
	Non-ionizing electromagnetic radiation	Indicates generally elevated, potentially hazardous, levels of non-ionizing radiation. Indicates equipment or systems that include RF transmitters or intentionally apply RF electromagnetic energy for diagnosis or treatment.
	Operator's manual; operating instructions	Identifies the location where the operator's manual is stored. Identifies information that relates to the operating instructions. Indicates that the operating instructions should be considered when operating the device or control close to where the symbol is placed.
	Option key	Identifies the device option key.
	Options installed	Indicates that device options have been installed.
	Output	Identifies an output terminal.
	Output exit	Identifies an output exit.
	Part number	Identifies the product part number.
	Quantity	Identifies the number of pieces in the package.
	Rechargeable battery	Identifies equipment that shall only be used with rechargeable (secondary) cells or batteries. Identifies rechargeable cells or batteries.
	Recyclable	Indicates that the marked item or its material is part of a recovery or recycling process.
	Refer to instruction manual	Signifies that the instruction manual must be read.
	Reference order number	Identifies the manufacturer's catalogue number.
	Rx only	Identifies the product as for use by prescription only.
	Serial number	Identifies the manufacturer's serial number.
	Singapore IMDA	Indicates product compliance with Infocomm Media Development Authority (IMDA) regulation. Unique certification number may be included with the symbol.

Table 132 **Symbol Glossary (Continued)**

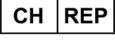
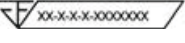
Symbol	Title	Description
	SpO ₂ port	Identifies the connecting port for the SpO ₂ cable.
	Stacking limit by number	Indicates that the items shall not be vertically stacked beyond the specified number, either because of the nature of the transport packaging or because of the nature of the items themselves. N is to be replaced by the maximum number of items allowed, which does not include the bottom package in the stack.
	Swiss authorized representative	Indicates the authorized representative in Switzerland.
	Thai FDA import license	Identifies the medical device license number of Thailand.
	Technical manual	Identifies the location where the manual is stored. Identifies information that relates to the servicing instructions for the equipment. Indicates that the service manual should be considered when servicing the device close to where the symbol is placed.
	Temperature limit	On the item, identifies the maximum and minimum temperature limits at which the item shall be used. On the package, identifies the maximum and minimum temperature limits at which the item with packaging shall be stored or transported.
	Temperature limit	Identifies the maximum and minimum temperature limits at which the item without packaging shall be stored or transported.
	Temperature port	Identifies the connecting port for the Temperature cable.
	Therapy port	Identifies the connecting port for the Therapy cable.
	This way up	Identifies the correct upright position of the transport package.
	UNECE regulation	Indicates product compliance with United Nations Economic Commission for Europe. E24 is used for Ireland.
	Unique device identifier (UDI) non-harmonized	Identifies the device.
	Universal Serial Bus (USB)	Identifies a port or plug as meeting the generic requirements of the Universal Serial Bus (USB). Indicates that the device is plugged into a USB port or is compatible with a USB port.
	Use by date	Indicates that the device should not be used after the date accompanying the symbol.

Table 132 **Symbol Glossary (Continued)**

Symbol	Title	Description
 	WEEE	Indicates that separate collection for waste electric and electronic equipment (WEEE) is required. The black line indicates that the item was put on market after August 2005.
MD	Medical Device	An indication that the device is a medical device.
UK CA	UKCA	Conformity to the UK regulations.

Abbreviation Definitions

Table 133 lists various abbreviations used with the HeartStart Intrepid and in these Instructions for Use.

Table 133 **Abbreviations**

Abbreviation	Definition
%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
A	Amps
AC	alternating current
AHA	American Heart Association
bpm	beats per minute
cm	centimeter
dB	decibel
dB(A)	A-weighted decibel
DC	direct current
EMC	electromagnetic compatibility
ERC	European Resuscitation Council
Hz	Hertz
in	inches
J	Joules
kg	kilograms
kPa	kilo Pascal
lb	pounds
m	meter
μs	microseconds
μV	microVolt
mA	milliAmpere
mV	milliVolt
min	minutes

Table 133 **Abbreviations** (*Continued*)

Abbreviation	Definition
mm	millimeter
mmHg	millimeters of mercury
ms	millisecond
mW	milliwatt
nA	nanoAmpere
nM	nanometer
NSA	No Shock Advised
PSD	Power Spectral Density
RFU	Ready For Use
rpm	respirations per minute
sec	seconds
V	Volt
VDC	Volts DC

Electromagnetic Compatibility

When using the HeartStart Intrepid, electromagnetic compatibility with surrounding devices should be assessed.

A medical device can either generate or receive electromagnetic disturbances. Testing for electromagnetic compatibility EMC with the appropriate accessories has been performed according to national and international standard for EMC for medical devices.

The EMC standards describe tests for both emitted and received disturbances. Emission tests deal with electromagnetic disturbances generated by the device being tested.

WARNINGS: Electromagnetic interference coming from other devices may degrade or obstruct the performance of the HeartStart Intrepid. The interference may come from signals radiated through the air, signals conducted through wired connections such as a power cord or patient connections, or device to device connections such as ECG analog output. Electromagnetic compatibility with surrounding devices should be assessed prior to using the HeartStart Intrepid.

When connected to a patient, symptoms of interference may include degraded performance of ECG signals from pads/paddles or ECG lead sets, unexpected technical alarms, or critical failure status on the RFU Indicator. Electromagnetic compatibility testing should include both radiated and conducted immunity. Testing in the presence of potentially interfering surrounding devices should assess typical HeartStart Intrepid usage scenarios including powering on, monitoring and delivering therapy.

Fixed, portable, and mobile radio frequency communications equipment could affect the performance of medical equipment.

Federal Communication Commission Interference Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

“Harmful interference” is defined in 47 CFR section 2.120 by the FCC as follows: Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radio communication service operating in accordance with the [ITU] Radio Regulations.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Radio Frequency Radiation Exposure

This device complies with the U.S. portable radio frequency (RF) exposure limit set forth for an uncontrolled environment and is safe for intended operation as described in this instructions for use.

RF exposure can be reduced by keeping the device as far as possible from the user's body or setting the device to a lower output power if such function is available.

Reducing Electromagnetic Interference

The HeartStart Intrepid and associated accessories may be susceptible to interference from other RF energy sources and continuous, repetitive, power line bursts. Examples of other sources of RF interference are medical devices, cellular products, information technology equipment and radio/television transmission. Should interference be encountered, as demonstrated by error conditions, artifact on the ECG or dramatic variations in parameter measurement values, attempt to locate the source. Assess whether the interference intermittent or constant.

- Does the interference occur only in certain locations?
- Does the interference occur only when in close proximity to certain medical devices?
- Does the interference occur only when certain medical devices are turned on?
- Does the interference occur only when certain medical devices are connected to the same patient as the HeartStart Intrepid?
- Do parameter measurement values change dramatically when the AC line cord is unplugged?

Once the source is located, attempt to attenuate the EMC coupling path by distancing the monitor/defibrillator from the source as much as possible or by changing the location or routing of wired connections. If assistance is needed, call your local service representative.

Essential Performance Determinations

Essential performance of the HeartStart Intrepid is derived from the device's safety risk assessment and includes:

- Delivery of defibrillation therapy (manual, AED, and synchronized cardioversion).
- Delivery of pacing therapy (fixed and demand).
- Monitoring of patient parameters (ECG monitoring, pulse oximetry, end-tidal CO₂, noninvasive blood pressure, and temperature).
- Detection and generation of physiological alarms.

All other functions are considered nonessential performance and have been monitored for EMC.

Restrictions for Use

Artifact on the ECG and parameter waveforms caused by electromagnetic disturbances should be evaluated by a physician or physician-authorized personnel to determine if it will negatively impact patient diagnosis or treatment.

Emissions and Immunity

Immunity is defined in the standard as the ability of a system to perform without degradation in the presence of an electromagnetic disturbance. Degradation in ECG quality is a qualitative assessment that could be subjective.

Caution should, therefore, be taken in comparing immunity levels of different devices. The criteria used for degradation is not specified by the standard and might vary with the manufacturer.

Note the following related to emissions and immunity:

- The HeartStart Intrepid is designed and tested to comply with the radiated and conducted emissions requirements of international and national standards. For information about declaration and guidance, see [Table 135](#) through [Table 140](#).
- The EMC standards state that manufacturers of patient-coupled equipment must specify immunity levels for their systems. For information about immunity, see [Table 135](#) and [Table 140](#).
- For cables, transducers, and other accessories for which Philips claims compliance with the emissions and immunity requirements, see “[Supplies and Accessories](#)” on page 217.

WARNINGS: Using accessories, transducers, and cables other than those specified might result in increased emissions or decreased immunity of the HeartStart Intrepid.

Using portable and mobile radio communications equipment can affect the operation of this device. Keep all portable and mobile radio communications equipment at a minimum distance of 30 cm (12 inches) from any part of the HeartStart Intrepid.

Guidance and Manufacturer's Declaration

The HeartStart Intrepid is intended for use in the electromagnetic environment specified in the tables below. The customer or the user of the HeartStart Intrepid should assure that it is used in such an environment.

Table 134 Electromagnetic Emissions

Emissions Test	Compliance	Electromagnetic Environment - Guidance
RF emissions CISPR 11/GB4824	Group 1	
RF emissions CISPR 11/GB4824	Class B	• Emergency medical services environment • Professional healthcare facility environment.
Harmonic emissions IEC 61000-3-2/GB17625.1	Class A	
Voltage fluctuations/flicker emissions IEC 61000-3-3/GB17625.2	Complies	

Table 135 Enclosure Ports

Immunity Test	Immunity Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±2, ±4, ±8, ±15 kV air	±8 kV contact ±2, ±4, ±8, ±15 kV air	Emergency medical services environment Professional healthcare facility environment
Radiated RF Electromagnetic Field IEC 61000-4-3	10 V/m 80 MHz - 2.7 GHz	10 V/m 80 MHz - 2.7 GHz	Emergency medical services environment Professional healthcare facility environment
Radiated RF Electromagnetic Field IEC 60601-2-4 (see Para. 202.6.2.3)	20 V/m (only defibrillation) 80 MHz to 2.7 GHz	20 V/m (only defibrillation) 80 MHz to 2.7 GHz	Emergency medical services environment Professional healthcare facility environment
Proximity fields from RF wireless communications equipment IEC 61000-4-3	Refer to table 136	Refer to table 136	Emergency medical services environment Professional healthcare facility environment
Power frequency magnetic field IEC 61000-4-8	30 A/m 50 Hz or 60 Hz	30 A/m 50 Hz or 60 Hz	Emergency medical services environment Professional healthcare facility environment

The emission of the HeartStart Intrepid can meet Class I limit level of CISPR 25 when powered by a DC-DC power supply.

Table 136 Proximity Fields from RF Wireless Communications Equipment

Test Frequency (MHz)	Band a) (MHz)	Service a)	Modulation b)	Modulation b) (W)	Distance (m)	Immunity Test Level (V/m)
385	380-390	TETRA 400	Pulse modulation 18 Hz	1.8	0.3	27
450	430-470	GMRS 460, FRS 460	FM ± 5 kHz deviation 1 kHz sine	2	0.3	28
710 745 780	704-787	LTE Band 13, 17	Pulse modulation 217 Hz	0.2	0.3	9
810 870 930	800-960	GSM 800/900, TETRA 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation 18 Hz	2	0.3	28
1720 1845 1970	1700-1990	GSM 1800; CDMA 1900; GSM 1900; DECT; LTE Band 1, 3, 4, 25; UMTS	Pulse modulation 217 Hz	2	0.3	28
2450	2400-2570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation 217 Hz	2	0.3	28
5240 5500 5785	5100-5800	WLAN 802.11 a/n	Pulse modulation 217 Hz	0.2	0.3	9

Table 137 Input AC Power Ports

Immunity Test	Immunity Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrical fast transient/burst IEC 61000-4-4	± 2 kV	± 2 kV	Emergency medical services environment Professional healthcare facility environment
Surge line to line IEC 61000-4-5	± 0.5 kV, ± 1 kV	± 0.5 kV, ± 1 kV	Emergency medical services environment Professional healthcare facility environment
Surge line to ground IEC 61000-4-5	± 0.5 kV, ± 1 kV, ± 2 kV	± 0.5 kV, ± 1 kV, ± 2 kV	Emergency medical services environment Professional healthcare facility environment
Conducted disturbances induced by RF fields IEC 61000-4-6	3 V 0.15 MHz - 80 MHz 6 V in ISM and amateur radio bands between 0.15 MHz and 80 MHz	3 V 0.15 MHz - 80 MHz 6 V in ISM and amateur radio bands between 0.15 MHz and 80 MHz	Emergency medical services environment Professional healthcare facility environment
Voltage dips, short interruptions, and voltage variations on power supply input lines IEC 61000-4-11	0% U_T ; 0,5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315° 0% U_T ; 1 cycle and 70% U_T ; 25/30 cycles Single phase: at 0°	0% U_T ; 0,5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315° 0% U_T ; 1 cycle and 70% U_T ; 25/30 cycles Single phase: at 0°	Emergency medical services environment Professional healthcare facility environment
Voltage interruptions IEC 61000-4-11	0% U_T ; 250/300 cycle	0% U_T ; 250/300 cycle	Emergency medical services environment Professional healthcare facility environment

Table 138 **Signal Input/Output Ports**

Immunity Test	Immunity Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±2, ±4, ±8, ±15 kV air	±8 kV contact ±2, ±4, ±8, ±15 kV air	Emergency medical services environment Professional healthcare facility environment
Electrical fast transient/burst IEC 61000-4-4	±1 kV	±1 kV	Emergency medical services environment Professional healthcare facility environment
Conducted disturbances induced by RF fields IEC 61000-4-6	3 V 0.15 MHz - 80 MHz 6 V in ISM and amateur radio bands between 0.15 MHz and 80 MHz	3 V 0.15 MHz - 80 MHz 6 V in ISM and amateur radio bands between 0.15 MHz and 80 MHz	Emergency medical services environment Professional healthcare facility environment

Table 139 **Input DC Power Ports**

Immunity Test	Immunity Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrical transient conduction along supply lines ISO 7637-2	Pulse 1, 2a, 2b, 3a, 3b, 4: Level III	Pulse 1, 2a, 2b, 3a, 3b, 4: Level III	Emergency medical services - environment Professional healthcare facility environment

Table 140 **Patient Coupling Ports**

Immunity Test	Immunity Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±2, ±4, ±8, ±15 kV air	±8 kV contact ±2, ±4, ±8, ±15 kV air	Emergency medical services environment Professional healthcare facility environment
Conducted disturbances induced by RF fields IEC 61000-4-6	3 V 0.15 MHz - 80 MHz 6 V in ISM and amateur radio bands between 0.15 MHz and 80 MHz	3 V 0.15 MHz - 80 MHz 6 V in ISM and amateur radio bands between 0.15 MHz and 80 MHz	Emergency medical services environment Professional healthcare facility environment

Table 141 **Wi-Fi Effective Radiated Power**

Networking Standard	Bands	Transmitter RF power Levels	Antenna Gain	EIRP
802.11a	UNII-1, UNII-2A, UNII-2C	17 dBm (50.1 mW)	3.9 dBi	21 dBm1
802.11a	UNII-3	15 dBm (31.6 mW)	4 dBi	19 dBm1
802.11b		17 dBm (50.1 mW)	2 dBi	19 dBm1
802.11g		17 dBm (50.1 mW)	2 dBi	19 dBm1
802.11n		17 dBm (50.1 mW)	2 dBi	19 dBm1
802.11n	UNII-1, UNII-2A, UNII-2C	17 dBm (50.1 mW)	3.9 dBi	21 dBm1
802.11n	UNII-3	15 dBm (31.6 mW)	4 dBi	19 dBm1

Table 142 **Wi-Fi Receiver Frequency and Bandwidth**

Networking Standard	Modulation type	TX/RX Frequency (GHz)*†	TX/RX Bandwidth
802.11a	OFDM	5*	20 MHz
802.11b	DSSS	2.4†	22 MHz
802.11g	OFDM	2.4†	20 MHz
802.11n	OFDM	2.4†	20 MHz (HT20)
			40 MHz (HT40)
		5*	20 MHz (HT20)
			40 MHz (HT40)

*See 5GHz channel to frequency map

†See 2.4GHz channel to frequency map

Table 143 **2.4 GHz Channel to Frequency Map**

Channel	Center Frequency (MHz)	Frequency Range (MHz)	Bandwidth (MHz)
1	2412	2401–2423	22
2	2417	2406–2428	22
3	2422	2411–2433	22
4	2427	2416–2438	22
5	2432	2421–2443	22
6	2437	2426–2448	22
7	2442	2431–2453	22
8	2447	2436–2458	22
9	2452	2441–2463	22
10	2457	2446–2468	22
11	2462	2451–2473	22

Table 143 2.4 GHz Channel to Frequency Map (Continued)

Channel	Center Frequency (MHz)	Frequency Range (MHz)	Bandwidth (MHz)
12	2467	2456–2478	22
13	2472	2461–2483	22
14	2484	2473–2495	22

Table 144 5 GHz Channel to Frequency Map

Channel	Center Frequency (MHz)	Frequency Range (MHz)	Bandwidth (MHz)
36	5180	5170–5190	20
40	5200	5190–5210	20
44	5220	5210–5230	20
48	5240	5230–5250	20
52	5260	5250–5270	20
56	5280	5270–5290	20
60	5300	5290–5310	20
64	5320	5310–5330	20
100	5500	5490–5510	20
104	5520	5510–5530	20
108	5540	5530–5550	20
112	5560	5550–5570	20
116	5580	5570–5590	20
120	5600	5590–5610	20
124	5620	5610–5630	20
128	5640	5630–5650	20
132	5660	5650–5670	20
136	5680	5670–5690	20
140	5700	5690–5710	20
149	5745	5735–5755	20
153	5765	5755–5775	20
157	5785	5775–5795	20
161	5805	5795–5815	20
165	5825	5815–5835	20

NOTES

[illegible]

Index

#

- 12-Lead ECG
 - acquiring 122
 - algorithm 119
 - algorithm, DXL 120
 - Critical Values
 - Acute ischemia statements 126
 - Acute MI statements 125
 - Complete Heart Block statements 127
 - Extreme Tachycardia statements 126
 - entering patient info 122
 - filters 127
 - Leads off 120
 - preview screen 120
 - report 124
 - accessing stored reports 127
 - set up 122
 - signal problems 123
- 12-Lead report
 - copy to data card 127

A

- aberrantly conducted beats 57
- Aberrantly-conducted beats 57
- AC Line Filter 165
- AC power cord guard 19
- Accessing USB drive 182
- Accessories 217
 - unsupported 217
- ACI-TIPI
 - display 125
- AED 66
 - adjusting volume 36
 - administer a shock 69
 - adult patients 73
 - AED Mode 63
 - AED View 65
 - alarms 74
 - Alarms button 28
 - defibrillating 67
 - ECG cannot be analyzed 69
 - ECG monitoring 73
 - energy dose settings 170
 - handling patient during ECG analysis 69
 - impedance 65
 - message area 33

- monitoring parameters 73
- monitoring pulse 73
- multifunction electrode pads 65
- no shock advised 69
- pads connect messages 67, 70, 72
- Patient Category button 28, 68
- precautions 64
- prompts 68
- shock advised 69
- shock button 27
- skin prep 49
- specifications 255
- SpO₂ 73
- successful resuscitation 65
- user messages 70

AHA CPR guidelines 145

- Alarms 235
 - adjusting volume 36
 - asystole 59
 - audio tones 40
 - AwRR 133
 - button 28
 - cannot analyze ECG 60
 - changing AwRR limits 135
 - changing EtCO₂ limits 135
 - changing SpO₂ limits 107
 - configuration options 164
 - continuous tone 40
 - ECG 59
 - ECG alarm chain 60
 - ECG in AED Mode 75
 - enabling AwRR 136
 - enabling EtCO₂ 135
 - enabling NBP 115
 - enabling SpO₂ 107
 - EtCO₂ 134
 - EtCO₂ limits 133
 - event markers 184
 - Event Summary 180
 - extreme brady 59
 - extreme tachy 59
 - general warnings 38
 - high priority 38
 - in AED Mode 74
 - manual defibrillation 89
 - multiple conditions 38
 - NBP 115
 - NBP limits 114
 - non-latching 37
 - pacing 97
 - parameter area 35

- periodic chirp 40
- periodic verification 206
- physiological 37
- power-related 213
- print options 172
- setting ECG limits 61
- single beep 40
- SpO₂ 105
- SpO₂ limits 104
- technical 37
- types 37
- alarms
 - temperature
 - changing limits 116
 - enabling/disabling 116

Algorithm

- ST/AR 47, 56, 74
- Apnea
 - changing limits 136
- Applying an SpO₂ sensor 103

Arrhythmia

- learning/relearning 57
- monitoring 56

Asystole 59

Audio

- Operational Check results 202
- tones 40

Auto Gain 165

Auto Test

- hourglass 209
- print options 172
- results 209
- RFU 208
- summary 208

Auto-Gain 33

Automatic NBP measurements 113

AwRR 134

- alarm limits 133
- alarms 134
- changing alarm limits 135
- enabling alarms 136

B

Basic orientation

- AC power cord guard 19
- adjusting volume 36
- AED View 65
- audio tones 40

- Auto-Gain indicator 33
 - automatic NBP measurements 113
 - beat labels 56
 - cable straps 20
 - calibration bar 33
 - carry bags 21
 - changing configuration settings 160
 - changing waveforms 35
 - connecting ECG cable 15
 - connecting NBP 15
 - connecting SpO₂ cable 14
 - controls 27
 - device back 18
 - Device Info report 228
 - device shutdown 31
 - display 32
 - entering patient ID 36
 - entering patient info 36
 - entering patient sex 36
 - getting started 7
 - hourglass 209
 - infant paddles 17
 - Lead Select button 28
 - making a selection 35
 - manual NBP measurements 113
 - Mark Events 37
 - menus 35
 - monitoring side 13
 - Operational Check 199
 - pacing view 92
 - printer 10
 - printing a strip 184
 - pulse rate 104
 - red X 209
 - restoring default settings 162
 - Rhythm label 33
 - R-Wave arrows 33
 - selecting an SpO₂ sensor 103
 - setting date and time 160
 - Shift Check 197
 - Smart Select Knob 27
 - soft keys 28
 - therapy cable 10
 - therapy cable collar 11
 - therapy port 10
 - top panel 15
 - turning device on 31
 - turning the device off 31
- Battery 18
- alarms 213
 - charge status 210
 - charging 211
 - discarding 212
 - extended storage 212
 - low battery condition 211
 - maintenance 210
 - Operational Check results 203
 - power 29
 - safety 212
- specifications 257
 - storage 211
 - troubleshooting 238
 - unsupported batteries 217
 - useful life 210
 - user checks 205
- Bedside monitor
- and synchronized cardioversion 86
- Before usage
- accessories 197
 - operational check 199
 - shift check 197
 - user checks 205
- Bundle branch block 57

C

- Cable management
 - operating conditions 216
 - user checks 205
- Cable straps 20
- Calibration bar 33
- Calling for service 243
- Cannot analyze ECG 60, 232
- cardioversion
 - synchronized 84
- Carry bags 21
- Certificate
 - Wi-Fi 175
- Changing configuration settings 160
- Changing leads with Lead Select button 28
- Changing NBP schedule 113
- Changing waveforms 35
- Charge
 - button 27
 - Event Summary 179
 - Operational Check results 202
 - cancelled 229
 - print options 172
 - synchronized cardioversion 87
 - the battery 211
- chemical content i
- Cleaning
 - device 214
 - device accessories 215
 - device printhead 215
 - frequency 213
 - NBP cuff 117
 - safety considerations 214
 - SpO₂ sensors 108
 - supplies for 214
- CO₂
 - see EtCO₂ 129
- CO₂ technical alarm 132
- Color
 - ECG options 165

- NBP options 166
 - SpO₂ options 167, 168
- Configuration 159
- Cellular 175
 - Certificate Management 175
 - exporting 161
 - importing 162
 - modifying settings 160
 - options 163
 - password 159
 - print 162
 - restoring defaults 162
 - setting date and time 160
 - TBI 168
 - Wi-Fi 174
- Connect Therapy cable message in AED Mode 70
- Connecting
 - NBP cuff 112
- Connecting the NBP Cable 14
- Continued use 26
- Controls 27
- conventions, this book ii
- CPR feedback 154
- CPR meter 2 145, 148
- adhesive pad 149
 - adhesive pads 149
 - electrode pads 149
 - performing CPR 151
 - placement 150
 - preparing to use 147
- CPR on a mattress 147
- Cuff pressure 110

D

- Dashed line 232
- Data management 180
 - available space 181
 - entering 181
 - event markers 184
 - events stored in event summary 187
 - exporting configuration 161
 - importing configuration 162
 - internal memory
 - deleting data 183
 - Mark Events 37
 - print 182
 - Print button 28
 - printing configuration 162
 - removing patient data 183
 - storage 262
- Date and time
 - Daylight Savings Time 163
 - location 32
- Default configuration 162
- Defib Disarmed 202

Defibrillating in AED Mode 67
 Defibrillation
 during pacing 97
 therapy 77
 definitions 267
 De-identifying patient data 165
 Deleting data, from internal memory 183
 Demand Mode pacing 93, 95
 Desat alarm 106
 Desat limit 105
 Device basics 9
 Device Info report 228
 Discarding the Battery 212
 Disinfecting
 device 216
 device accessories 216
 supplies for 214
 Display 257
 dashed lines 55
 date and time 32
 ECG bandwidth 165
 status area 32
 Wave Sector 2 35
 Wave Sector 3 35
 Docking station
 attaching the Intrepid 248
 detaching the Intrepid 251
 installing 246
 parts 245
 removing 248
 DXL Algorithm 119, 120

E

ECG 119
 aberrantly-conducted beats 57
 alarm chain 60
 alarms 59
 Alarms button 28
 analysis optimization 36
 arrhythmia beat labels 56
 asystole alarm 59
 Auto-Gain indicator 33
 bandwidth 165
 bundle branch block 57
 Calibration bar 33
 cannot analyze 60
 changing waveforms 35
 dashed line 55, 232
 ectopic event 59
 electrode placement 51
 Event Summary 179
 extreme brady 59
 extreme tachy 59
 lead choices 53
 Lead Select button 28
 lead selection 53
 lead size, arrhythmia analysis 54
 leads rerun in Operational Check 201
 learning 57
 manual relearning 58
 Mark Event button 28
 Mark Events 37
 monitoring with electrodes 50
 monitoring with pads 50
 normal complex 57
 parameter limits 166
 Patient Category button 28
 preparing to monitor 49
 Print button 28
 quick look 80
 report
 display 125
 Rhythm label 33
 R-Wave arrow 33
 selecting a waveform 54
 setting alarm limits 61
 skin prep 49
 specifications 255
 v-fib/v-tach 59
 Wave Sector 1 33, 54
 Wave Sector 2 35
 Wave Sector 3 35
 waveforms 47
 ECG cable 15
 Ectopic Event 59
 Electrode labels 166
 Electrode pads
 skin preparation 49
 electrode pads 149
 Electrode placement 51
 Electrodes, monitoring 50
 Electromagnetic Compatibility 273
 Electromagnetic interference
 reducing 274
 Emissions and Immunity 275
 Energy doses in AED Mode 170
 Entering patient ID 36
 Entering patient information 36
 Entering patient sex 36
 Environmental specifications 263
 operating temperature 263
 storage temperature 263
 transient humidity 263
 transient temperature 263
 ERC CPR guidelines 145, 154
 EtCO₂ 129
 alarm 134
 alarm limits 133
 changing alarm limits 135
 changing apnea alarms 136
 connecting filter line 13
 disabling 139
 enabling alarms 135
 Event Summary 179
 monitoring 129, 133
 nasal filter line 132
 picking an accessory 132
 precautions 130
 question marks 133
 zeroing messages 138
 zeroing sensor 136
 Smart Select knob 137
 soft key 137
 Event markers 184
 Event Summary
 alarms 180
 charge button 179
 data collected 180
 data limit 179
 ECG 179
 EtCO₂ 179
 events stored 187
 exporting de-identified data 183
 Mark Events 37, 179
 memory full 179
 NBP 113, 179
 pacing 91, 180
 Print button 28
 print options 172
 printing a saved event 182
 SpO₂ 179
 stored events 187
 Exiting Configuration Mode 159
 Exporting
 configuration settings 161
 data 182
 External paddles
 as monitoring lead 88
 manual defibrillation 81
 Operational Check results 203
 quick look 80
 shock 84
 synchronized cardioversion 88
 troubleshooting 229, 231
 external paddles 15
 Extreme brady 59
 Extreme tachy 59

F

Factory default settings 162
 fascicular block 57
 Filter line 132
 Fixed Mode pacing 96
 demand vs. fixed 93
 Flat line 232
 Fourth intercostal space, locating 52
 Frequency of NBP 166

G

Getting started 7

H

Heart rate
accuracy 256

Hourglass 209

I

Imminent shutdown tone 40
Impedance 65
Importing configuration settings 162
Indications for Use 3
infant
pads, multifunction 223
Infant paddles
using 82
infant paddles 17
Initial NBP cuff pressure 111
Inspection
accessories 197
operational check 199
shift check 197
user checks 205
weekly shock test 205
Intended Use 2
Interference
reducing electromagnetic
interference 274
Internal memory
removing patient data 183
Internal pacemaker
ECG analysis optimization 36
synchronized cardioversion 78
Internal paddles
shock 84
using 82
introduction 1, 25, 91, 129, 159, 179, 184,
207, 217

L

Lead choices 53
Lead Select
button 28, 54, 95
troubleshooting 232
wave sector 1 33
Lead selection 53
Leads
pacing 92
Learning ECG 57
Low battery condition 211

M

Maintenance 207
Auto Test
hourglass 209
results 209
summary 208
battery safety 212
battery storage 211
cable management 216
calling for service 243
caring for NBP cuffs 117
cleaning SpO₂ sensors 108
discarding battery 212
leads rerun 201
Operational Check 199
power alarms 213
RFU 208
Shift Check 197
user checks 205
Making a selection 35
Manual defibrillation 77
adjusting volume 36
alarms 89
Alarms button 28
charge 83
charge button 27
code view 79
defibrillating asystole 78
energy selected 79
external paddles 81
infant paddles 82
internal paddles 82
Mark Event button 28
message area 33
NBP 109
Patient Category button 28
precautions 78
preparation 81
quick look 80
shock 84
shock button 27
shock counter 79
shock series 170
skin prep 49
specifications 255
therapy knob 27
three steps 83
with pads 81
Manual NBP measurements 113
Mark Event 37
button 28
event markers 184
Event Summary 179
pacing 91
print options 172
Measuring NBP 112
Menus 35

grayed out options 35

Message area 33
Modifying configuration settings 160
Monitor
SpO₂ 104
Monitor Mode
Alarms button 28
Mark Event button 28
Monitor View
dashed lines 55
Monitoring ECG
with electrodes 50
with pads 50
MRI 101
Multifunction electrode pads
Operational Check results 203
preconnected 68
reducing burn risk 50
supported 223
troubleshooting 229, 231
unsupported 218

N

nasal filter line 132
NBP 109
AED 109
alarm limits 114
alarms 114, 115
Alarms button 28
automatic measurements 113
changing automatic schedule 113
cleaning cuff 117
connecting the cuff 112
cuff pressure 110
enabling alarms 115
Event Summary 113, 179
manual measurements 113
measuring 112
message area 33
Operational Check results 204
parameter area 35
precautions 110
qx in menu 113
specifications 262
start 112
systolic 114
time intervals 113
NBP Cable 14
NBP cable 15
No capture 59
No Power 238
No shock advised in AED Mode 69
No shock delivered 65
Non-latching alarms 37

O

Online viewing only ii

Operating conditions

- cable management 216
- operating temperature 263
- storage temperature 263
- transient humidity 263
- transient temperature 263

Operational Check 199

- battery 203
- entering 198
- external paddles 203
- leads rerun 201
- NBP 204
- pads 203
- performing 199
- print options 172
- printer 204
- results 201
- SpO₂ 204
- user checks 205

Options, configuration 163

Ordering supplies 217

output, Pacer 95, 96

P

Pace pulse duration 94

Pacer Not Capture 59

Pacer Not Pace 59

Pacer Output 170

Pacer output 95, 96

Pacer Rate 95, 96, 170

Pacing 59, 91

- alarms 97
- Alarms button 28
- battery failure 94
- changing modes 96
- charge button 27
- defibrillation 97
- Demand Mode 95, 232
- device shutdown 31
- ECG analysis optimization 36
- Event Summary 180
- fixed mode 96
- Lead Select button 95
- lead sets 92
- Mark Event button 28
- NBP 109
- not pacing 59
- pace pulse duration 94
- Patient Category button 28
- power loss 94
- preparation 93
- pulses delivered 93
- R-Wave arrows 95
- shock button 27
- skin prep 49
- specifications 258
- stopped 230
- stopping 95
- TENS unit affects 94
- therapy knob 27
- troubleshooting 230
- view layout 92
- with a second defibrillator 97

Pads

- manual defibrillation 81
- monitoring 50

Parameter area 35

Passwords 43

- configuration 159

Patient category

- adult 73
- button 28, 68
- configuration options 164
- NBP 112

Patient Data, Event Summary 180

Patient information

- entering name 36
- entering patient ID 36
- entering sex 36

PCI Indicators 16, 66, 80

Performance

- reducing electromagnetic interference 274

Physiological alarms 37

Pleth wave 104

Power 29

- alarms 213
- battery safety 212
- battery status 210
- battery storage 211
- battery, Operational Check results 203
- charging the battery 211
- device shutdown 31
- discarding the battery 212
- imminent shutdown tone 40
- indicators 30
- specifications 253
- user checks 205

power

- restored after shutdown 31

Preconnected pads 68

Preparing for manual defibrillation 81

Print 184

- button 28
- configuration settings 162
- current Event Summary 187
- during an event 184
- ECG bandwidth 166
- event markers 184

Operational Check 204

- saved event summary 182
- user checks 205

Printer 12, 13

Printing

- a strip 184
- configuration settings 162

Pulse

- parameter area 35
- rate 104

Q

Q-CPR

- CPR feedback 154

 - adjusting volume 156

- data capture 145
- data/events recorded 157
- reviewing data 158
- ERC guidelines 154
- on a mattress 147
- overview 145
- research data storage 157
- warnings 147

QRS 231, 235

- adjusting volume 36
- configuration options 164

Quick look 80

R

rate, Pacer 95, 96

Red X

- Auto Test results 209
- blinking 29
- solid 29

Relearning ECG 57

Removing patient data 183

Reports

- device info 228
- events stored in Event Summary 187
- printing configuration settings 162

Results from Operational Check 201

RFU 29, 208

Rhythm label 33

R-Wave

- aberrantly conducted beats 57
- arrows 33
- synchronized cardioversion 87

S

Safety

- accessory precautions 218
- AED precautions 64
- alarm warnings 38
- battery precautions 212

- flammable gases 43
 - general considerations 43
 - manual defibrillation precautions 78
 - NBP precautions 110
 - SpO₂ precautions 101
 - standing water 43
 - synchronized cardioversion precautions 84
 - Safety considerations 7
 - Screen prompts, AED 68
 - Selecting an SpO₂ sensor 103
 - Service 207, 227
 - Setting date and time 160
 - Shift Check 197
 - Shift Checklist 197
 - Shock
 - administering in AED Mode 69
 - advised in AED Mode 69
 - button 27
 - Operational Check results 202
 - counter 79
 - energy dose in AED 170
 - event markers 184
 - print options 172
 - rhythms 255
 - series 170
 - synchronized cardioversion 86
 - timeout 170
 - shutdown
 - power restored 31
 - Shutdown countdown 31
 - Signal Quality 123
 - Skin preparation 49
 - SMART
 - Pads 223
 - Smart Select Knob 27
 - Smart Select knob 35
 - Soft keys 28, 66
 - AED Mode 66
 - Solid red X 29
 - Specifications
 - AED 255
 - battery 257
 - CPR meter 2 264
 - data storage 262
 - defibrillator 253
 - display 257
 - ECG 255
 - environmental 263
 - general 253
 - manual defibrillation 255
 - NBP 262
 - pacing 258
 - SpO₂ 258
 - synchronized cardioversion 255
 - SpO₂
 - accurate measurements 102
 - AED configuration 169
 - alarm limits 104
 - alarms 105
 - Alarms button 28
 - and MRI 101
 - caring for sensors 108
 - changing alarm limits 107
 - desat alarm 106
 - desat limit 105
 - edematous tissue 103
 - enabling alarms 107
 - Event Summary 179
 - how it works 102
 - message area 33
 - monitoring 104
 - Operational Check results 204
 - parameter area 35
 - perfusion 103
 - pleth wave 104
 - precautions 101
 - pulse rate 104
 - sensor 102, 103
 - specifications 258
 - user checks 205
 - values 104
 - SpO₂ cable 14
 - ST/AR Algorithm 47, 56
 - Starting an NBP measurement 112
 - Storing the battery 211
 - substances of very high concern i
 - Supplies, ordering 217
 - sustainability i
 - SVHC i
 - Symbols 267
 - Sync function
 - configuration 169
 - delivering extra shocks 88
 - turning off 88
 - Synchronized cardioversion 86
 - additional shocks 88
 - adjusting volume 36
 - Alarms button 28
 - and a bedside monitor 86
 - button 27
 - Operational Check results 202
 - charge 87
 - charge button 27
 - code view 86
 - external paddles as monitoring lead 88
 - internal pacemaker 78
 - Mark Event button 28
 - message area 33
 - NBP 109
 - non-paddles lead 88
 - Patient Category button 28
 - precautions 84
 - preparation 85
 - R-Wave arrows 87
 - shock 87
 - shock button 27
 - shock delivery 86
 - skin prep 49
 - specifications 255
 - with external paddles 88
 - Systolic NBP 114
-
- ## T
-
- TBI 141–143
 - hypotension 141
 - hypoxia 141
 - Technical Alarm
 - troubleshooting 227
 - Technical alarms 37
 - Temperature
 - alarms
 - changing 116
 - enabling/disabling 116
 - changing degree units 116
 - disabling 117
 - troubleshooting 242
 - TENS unit, pacing 94
 - Therapy cable
 - collar 20
 - connecting 10
 - installing lid 11
 - Therapy knob 27
 - Time intervals for NBP measurements 113
 - Transient operating conditions 263
 - Traumatic Brain Injury
 - Overview 141
 - Traumatic Brain Injury (TBI) Advisory 141
 - Traumatic Brain Injury Advisory 141
 - Trending
 - Print button 28
 - Trends
 - about 184
 - print from internal memory 182
 - setting trend intervals 185
 - viewing 185
 - Troubleshooting 227
 - AED Mode user messages 70
 - calling for service 243
 - Device Info report 228
 - external paddles 229, 231
 - flat line 232
 - Lead Select button 232
 - message area 33
 - no shock delivered 65
 - pacing 230
 - pads 229, 231
 - solid red X 29

- symptoms 228
- troubleshooting
 - temperature issues 242
- Turning the device off 31
- Turning the device on 31

U

- USB
 - accessing the drive 182
 - exporting configuration settings 161, 162
 - user checks 205
- USB port 18
- User checks during Operational Check 205
- User messages in AED Mode 70

V

- V-Fib 59
- viewing, online ii
- Voice prompts
 - adjusting volume 36
 - AED 68
- Volume 231
 - configuration options 164
- V-Tach 59

W

- Wave Menus 55, 107
- Wave Sector 1 33
 - pacing 93
 - Rhythm label options 34
- Wave Sector 2 35
- Wave Sector 3 35
- Waveform Print Speed 172
- Weekly Shock Test 205
- Wi-Fi
 - certificate 175

Z

- Zeroing EtCO₂ 136
 - messages 138
 - Smart Select knob 137
 - soft key 137

NOTES

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