

## Technical Note

### SELF-TESTS: HEARTSTART ONSITE DEFIBRILLATOR

(HSI FAMILY, INCLUDING HEARTSTART HOME AND HEARTSTART DEFIBRILLATORS)

The Heartstart OnSite Defibrillator performs many different self-tests to help ensure that the device is ready for use. If there are any problems with the device, it will notify the user to perform maintenance. These tests include extensive periodic tests and general use continuous tests.

#### USER-INITIATED TESTS

##### Battery Insertion Self-Test (BIT)

The Battery Insertion Self-Test (BIT) is the most comprehensive suite of tests performed by the device. It is initiated by inserting a battery into the defibrillator with a closed adult or infant/child clinical (not training) cartridge installed. It is recommended that the user run a BIT to evaluate device readiness for use when the defibrillator is first placed into service, when a new battery is installed, or after a use.

##### Pads Identification Test (PIT)

The Pads Identification Test (PIT) verifies the pads cartridge's identity (adult or infant/child, clinical or training) and that the cartridge is correctly installed. It is initiated when the user installs a pads cartridge in the defibrillator.

#### PERIODIC SELF-TESTS (PST)

Periodic self-tests (PSTs) are normally performed when the device is in standby mode. The defibrillator's internal circuitry “wakes up” on a scheduled basis to perform the tests. There are three kinds of PSTs:

- Daily Periodic Self-Test (DPST)
- Weekly Periodic Self-Test (WPST)
- Monthly Periodic Self-Test (MPST)

The systems tested and the nature of the testing are detailed in the following table.

## THE HEARTSTART ONSITE SELF-TESTS

### Tests Performed Periodically

SUBSYSTEM	TEST	WHEN TEST IS PERFORMED				
		BIT	PIT	DPST	WPST	MPST
Computer and Data Processing	Computer Processor and Memory Test - Verifies that the computer processors and system memory are operating properly.	✓	✓	✓	✓	✓
Pads	Pads Integrity Test - Verifies that installed pads are in good condition. Assesses readiness for use based on gel moisture			✓	✓	✓
	Pads Identification Test - Verifies the cartridge type and that it is correctly installed.	✓	✓	✓	✓	✓
Shock Delivery	Device Functionality Test - Verifies that the systems responsible for interpreting the electrocardiogram (ECG) signal are operating appropriately and ensures that all systems used to deliver the shock are functioning properly.	✓		✓	✓	✓
Power Supply	Power Supply Test - Verifies the power supply system is operating properly.	✓		✓	✓	✓
Calibration	Voltage Reference Test - Verifies that the voltage used for internal reference is correct	✓		✓	✓	✓
	High-Voltage Calibration Test - Ensures that the system that delivers the shock is using the correct parameters. Charges and discharges the capacitor to verify correct energy delivery.	✓				✓
	ECG Calibration Test - Ensures that the systems responsible for interpreting the electrocardiogram (ECG) signal are using accurate references.	✓			✓	✓

SUBSYSTEM	TEST	WHEN TEST IS PERFORMED				
		BIT	PIT	DPST	WPST	MPST
User Interface	User Interface Test - Prompts the user to verify that the Shock button and speaker are operating.	✓				
	Button Test - Automatically verifies that the Shock button, On/Off button, and Information button (i-button) are not stuck and are ready for use.	✓		✓	✓	✓
	Audio System Test - Verifies that the audio drivers and sound files are working properly.	✓			✓	✓

### Tests Performed Continuously

In addition to periodic tests, the device continuously executes a series of tests to check its basic safety and readiness for use. These continuous tests are collectively called the Run Time Self-Tests (RTST). These tests occur whenever the device is powered on, including running while other self-tests such as BITs or DPSTs are being performed. Therefore, these tests are performed in addition to any periodic self-test. For example, the battery capacity will be tested by the RTST while the DPST is being performed. The continuous RTST includes checks of:

TEST	DESCRIPTION
Battery Capacity	Measures remaining battery capacity to warn user if the battery becomes low or if the device is stored outside the standby temperature ranges.
Power Supply	Verifies that the power supply is producing the correct voltage
ECG	Checks if pads are attached to a patient and if the device is receiving a recognizable ECG signal.
Shock Engine	Verifies that the power discharge system is ready for use.
Software	Ensures internal programs are communicating with each other.

## Self-Test Results

The device will report the passing or failing of any tests using the following series of flashing lights and chirping sounds. The indications, test results, and recommendations are:

STATUS INDICATORS	TEST RESULTS	RECOMMENDATIONS
Green Ready light flashes once every 3 seconds. Device does not chirp.	Pass	The device has passed its last self-test and is ready for use.
Green Ready light is off. Blue i-button flashes, and device chirps once every 8 seconds.	Warning	A minor failure has occurred. The defibrillator will attempt to continue working in this condition. It is recommended that you attempt to use the defibrillator in an emergency if no other defibrillator is available. Troubleshoot the problem as soon as possible. Contact Philips Medical Systems for service if condition persists.
Green Ready light is off. Blue i-button flashes, and device chirps three times every 8 seconds.	Fail	Device is not ready for use. Do not use the defibrillator. Troubleshoot the problem as soon as possible. Contact Philips Medical Systems for service if condition persists.

## BASIC TROUBLESHOOTING

Basic troubleshooting includes:

- Press the blue i-button for information. The defibrillator will inform the user of the cause of the problem.
- Verify that a training cartridge has not been left in the device for more than one hour. The defibrillator will chirp if a training pads cartridge installed for an extended period without being used.
- Verify that an adult or infant/child clinical (not training) cartridge is properly installed with the hard cover in place. The HeartStart self-testing checks for the presence of both the cartridge and the hard cover and will not pass if they are not installed.
- Remove the battery for five seconds and then reinstall it to initiate a battery insertion self-test. This self-test will examine all aspects of the HeartStart to ensure proper operation. If the self-test fails, insert a new battery and repeat the test. If it fails again, do not use the defibrillator. Contact your local Philips Customer Service.

For any service-related issues, contact your local Philips Customer Service. In the United States, contact the Philips Medical Systems Service Center at 1-800-263-3342 for assistance.

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