

SELF-TESTS

HeartStart HS1 Defibrillator Family

(HeartStart OnSite Defibrillator, HeartStart Home Defibrillator, and HeartStart Defibrillator)

The Heartstart HS1 family of defibrillators performs many different self-tests to help ensure that the unit is ready for use. If there are any problems with the unit, it will notify the user to perform maintenance. These tests include extensive periodic tests and general use continuous tests.

PERIODIC 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 invoked when the user inserts a battery into the instrument with a closed adult or infant/child clinical (not training) cartridge installed. The BIT helps the user to evaluate readiness for use when the device 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 and that the cartridge is correctly installed. It is invoked when the user inserts an adult or infant/child clinical cartridge or an adult or infant/child training cartridge.

Periodic Self-Tests (PST)

A PST is normally performed when the unit is in standby mode. The unit's internal circuitry wakes itself up on a scheduled basis to perform the tests. The unit performs three different levels of Periodic Self-Tests:

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

CONTINUOUS TESTS

Run Time Self-Test (RTST)

The Run Time Self-Test (RTST) is a collection of tests for basic safety and readiness for use. It is performed continuously whenever the unit is operating, including during other tests.

The systems tested and the extent of the testing is detailed in the table on the following page:

THE HEARTSTART HS1 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.	✓	✓	✓	✓	✓
CARTRIDGE	Pads Integrity Test - Verifies that installed pads are in good condition. Assesses readiness for use.			✓	✓	✓
	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 ECG (Electrocardiogram) 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 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 ECG (Electrocardiogram) 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 the Shock button and speaker are operating.	✓				
	Button Test - Automatically verifies that the Shock, On/Off and Information buttons 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 unit continuously executes a series of tests to check the basic safety and readiness for use. These continuous tests are collectively called the Run Time Self-Tests (RTST). These tests occur whenever the unit 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 test. For example, the battery capacity will be tested by the Run Time Self-Test (RTST) while the Daily Periodic Self-Test (DPST) is performed. The continuous RTST includes checks of:

BATTERY CAPACITY	Measures remaining battery capacity to warn user if the battery becomes low or if the unit 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 unit is receiving 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 unit 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. Makes no chirping noises.	Pass	Unit has passed its last self-test and is ready for use.
Green Ready Light is not lit. Blue Information Button flashes and unit 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 not lit. Blue Information Button flashes and unit chirps three times every 8 seconds.	Fail	Unit 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 for these test failures:

- Press the blue i-button for information. Pressing the button will inform the user of the cause of the problem.
- Verify that a training cartridge has not been left in the unit for more than one hour. The HS1 will not allow a training pads cartridge to be left inserted for extended periods without training being performed.
- Verify that an adult or infant/child clinical (not training) cartridge is properly installed with the hard cover in place. The HeartStart is able to detect both the cartridge and the hard cover and will not pass the tests if they are not installed.
- Remove the battery for five seconds and then reinstall it to start the 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 HeartStart. Contact your local Philips service center.

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