
Tech Note

# HSM-300 Heart Sounds Monitor

## Overview

The HSM-300 is a simple device which converts the sound waves, created by the heart valves opening and closing, into voltages which can be recorded and displayed. A piezo-electric sensor, mounted on the side of the HSM-300 picks up the vibrations that are created by the heart sounds. The piezo crystals on the sensor convert the changes in pressure created by the vibrations into voltages. These voltages are usually recorded along with the ECG of the subject to identify the specific heart sounds that occur during ventricular contraction and relaxation.

## How It Works

The silver-colored sensing element of the HSM-300 is placed on the chest of the subject at one of the four prescribed auscultation areas. These areas are located over sections of the heart and large vessels containing the valves that create the heart sounds that can be heard with a stethoscope. The sensor of the HSM-300 picks the low frequency sound waves of the heart sounds and converts these waves into voltages that can be seen on a computer screen. The output of the HSM-300 is amplified so that the recorded waves are about 1V in amplitude (Figure 6-2).

## Equipment Setup

Plug the connectors of the HSM-300 and the ECG cable into the appropriate inputs of an amplifier or a data acquisition unit (Figure 1).

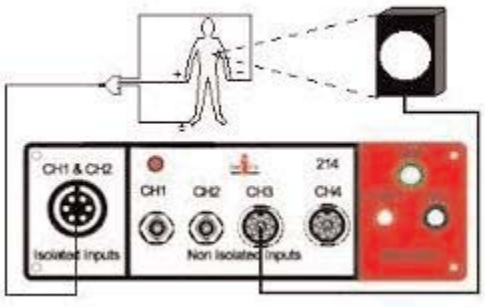


Figure 1: Diagram demonstrating the connection of the HSM-300 and the ECG recording cable to an iWorx 214 data acquisition unit.

## Recording Heart Sounds

Place the ECG electrodes on the subject as he or she sits quietly. Connect the lead wires to the electrodes. Place the HSM-300 firmly over one of the auscultation areas.

Begin recording the subject's ECG and the heart sounds. The subject should hold his or her breath for a short period while recording. Once a good segment of ECG and heart sound data have been recorded (Figure 2), stop recording.

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## Analysis with LabScribe

If LabScribe was used to make the recording, scroll to the section of the recorded data with good ECG and heart sounds data (Figure 2). Use the Display Time icons on the LabScribe toolbar to display six complete cardiac cycles on the screen.

Click the 2 Cursor icon on the LabScribe toolbar to place two blue cursors on the window. Move the cursors left and right to select five complete cardiac cycles.

Click the Analysis icon on the LabScribe toolbar to send the selected region of data to the Analysis window.

Figure 2: Recording of heart sounds (lowest trace) made with a HSM-300 heart sound monitor connected to an iWorx 214 data acquisition unit. The ECG and the absolute integral of the heart sounds were also recorded.

Display the ECG, the heart sound trace, and the absolute integral of the heart sounds on the Analysis window.

Display the channel Title, Area, and T2-T1 as Table Functions.

Click and drag the cursors on the Analysis window to make measurements of the durations of each heart sound and the area under the absolute integral of each heart sound. The ventricles begin to contract and the atrioventricular valves close at about the same time the R wave occurs in the ECG. Observe if this occurs in your data.

## Experiments

Experiments using the HSM-300 can be downloaded by clicking on the following links:

Print-disabled Heart Sounds experiment (PDF file).

User Area (password protected)
High resolution press optimized or low resolution screen optimized Heart Sounds experiment (PDF file).

## Specifications

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|---|---|
| Excitation voltage: | +4 VDC |
| Output connector: | DIN8 |
| Power: | From DIN8 input of iWorx amplifier or A/D |

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