COM. is an intercom device that connects and controls all SONOS speakers within the same network. It allows the user to do the following:

- Talk to any of the speakers.
- Control music on any of the speakers.

COM. is an important step towards building a complete home network of SONOS products.

Overview

COM. includes 4 capacitive touch areas and an easy to read LCD screen.

Physical Design

Important Components:
- Shell is made of PC plastic, with a high resistance to drops and ultraviolet light.
- Gaskets of silicon rubber to achieve splash resistance.
- PCB board with an LCD screen, WiFi module, micro-USB power source and microphones.
- Aluminum heatsink attached to the bottom of the PCB.
- Antenna partially inserted into the heatsink, attached via a carrier.
- Bottom shell that allows easy assembly with screws.
- Bottom silicon rubber padding attached to the shell with PSA.

Hardware Design

Music Mode

In music mode, play, pause, and skip tracks for any room in your home.

Intuitive Control

COM. includes 4 capacitive touch areas and an easy to read LCD screen.

Intercom Mode

In intercom mode, choose any room, speak to it, and be heard.

Original Criteria

<table>
<thead>
<tr>
<th>Accomplished?</th>
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<tbody>
<tr>
<td>Yes</td>
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Acknowledgements

Capstone Team


Computer Engineering: Marcellis Carr-Barfield, Subhodeep Choudhury, Brian Sandler, Richard Wei, Brenden Fujishige, and Mohammad Cazi.

UCSB: Tyler Susko, Carl Meinhart, Ted Bennett, Steve Lagurette, Trevor Marks, John Johnson, Yogarandas Isukapalli, Ilan Ben-Yacov, Ekta Prashnani, Sean Mackenzie, Cao Mota, and Celestie Been.

SONOS: Camille Zaba, Nathan Pike, Connor Buckland, Farhad Mirbod, Daniel Huthsing, Vicki Chen, and Gregorio Teller.

Laritech: Bill Larrick, Veronica Ellias, Lillian Ware, and Kristin Bradley.
**COM.**
An intercom device for the SONOS system.

**Durable and Stylish**
Drops and discoloring? Forget about it.
The COM. enclosure uses a high quality polycarbonate plastic.

**Splash Resistant**
Gaskets of silicon rubber make sure that your COM. can withstand any home environment.

**Cool as a Cucumber**
Not only is this device cool to the touch due to a custom aluminum heatsink, it is also just cool in general.

**Tap away.**
The silicon rubber padding on the base of the unit will let you tap until your heart’s content while preventing the device from slipping and sliding around.

**Simple Setup**
1. Plug it in.
2. Connect to the “SONOS COM.” WiFi network.
3. Use the app to send your SSID and password.

**Specifications**

**Wireless Network Connectivity**
WiFi b/g/n supported.
Customized SONOS antenna to optimize signal quality.

**Dual Microphone Setup**
Two digital microphones create unlimited potential for high quality recording.

**LCD Display**
An 18-bit color TFT LCD display maximizes the user experience.

**Capacitive Touch Controller**
Allows for an intuitive user experience.

**Compact**
A custom made schematic, layout, and 4 layer PCB that enables us to fit everything into a small form factor.

**Specification and Testing Results**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Desired Value</th>
<th>Final Results</th>
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<tbody>
<tr>
<td>Mass</td>
<td>185 g</td>
<td>248.5 g</td>
</tr>
<tr>
<td>Surface Temperature</td>
<td>&lt;48℃</td>
<td>&lt;26℃</td>
</tr>
<tr>
<td></td>
<td>&lt;118.4℉</td>
<td>78.8 ℉</td>
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<tr>
<td>Highest Operating Temperature</td>
<td>&lt;125℃</td>
<td>43℃</td>
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<tr>
<td>(CPU)</td>
<td>&lt;257℉</td>
<td>109.4 ℉</td>
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<tr>
<td>Water Resistance Level</td>
<td>IP 62</td>
<td>IP 62</td>
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<tr>
<td>Microphone</td>
<td>THD₁ 10%</td>
<td>THD₁ 32.6%</td>
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</table>

**Software and Behavioral Design**
The functionality of the COM. is split into two modes: music control and intercom. The software performs different actions depending on what inputs the device registers and what mode it is in. After the initial startup sequence, the COM. will be in one of those two modes using a state machine.

**Music Mode**
**Intercom Mode**

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Camille Zaba, Nathan Pike, Connor Buckland, Farhad Mirbod, Daniel Huthsing, Vicki Chen, and Gregorio Teller.

Sonos: Camille Zaba, Nathan Pike, Connor Buckland, Farhad Mirbod, Daniel Huthsing, Vicki Chen, and Gregorio Teller.

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