Probe Droid Studio-Scale Model Sound Board w/ LEDs, Motion Sensor, and Servo Motor Outputs
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### http://www.hyperdynelabs.com

FUNCTIONAL OVERVIEW

Once powered up, the probe droid (PD) sound board plays out sound effects when motion is detected nearby. Sound effects include blaster fire, probot talking, thruster sounds, antennas moving, transmission sounds, and the ESB scene. Also, the "eye" LED light will fade in and out while sound is played back. A blaster LED is also included that is synchronized to several of the blaster sounds.

This kit also controls up to 3 hobby servo motors. Two outputs on the board are for motorizing the probot antennas, and one is for motorizing random head movements.

The PD sound package comes with:

- programmed and assembled PC board
- small speaker (wired up)
- master power switch (wired up)
- eye and blaster 5mm LED
- sound module with sounds on programmed microSD card
- 250mW audio amp
- (optional) 1W amplifier add on board

Here is a pic of the kit:
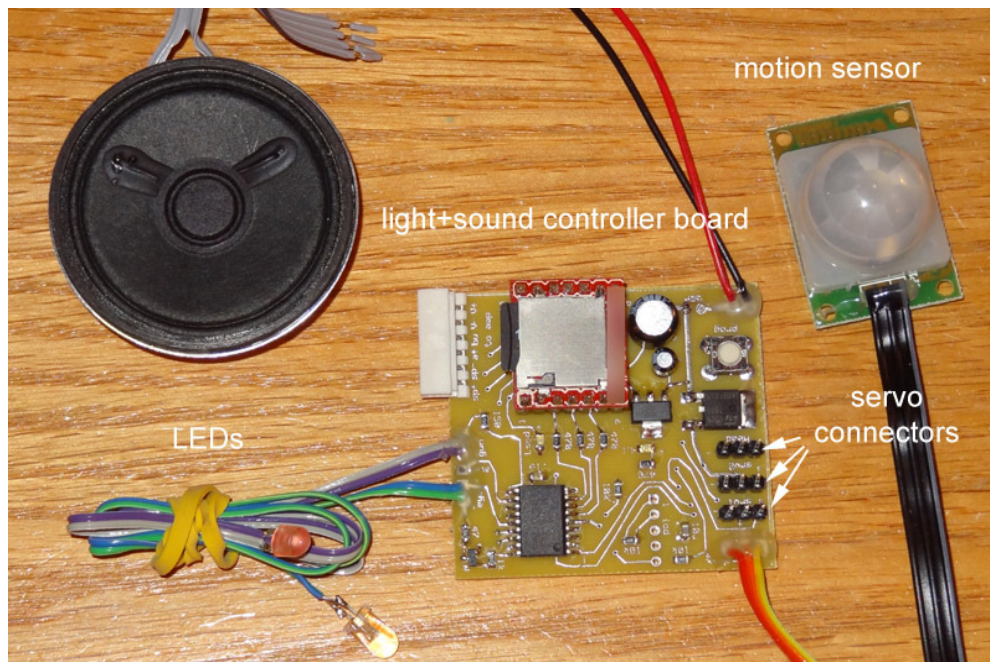
IR MOTION DETECTOR

The IR motion detector is already attached to the sound board. Here is the pic of it:

The IR sensor derives power from the sound board. When the sound board is powered up, it will take the IR sensor 30 seconds before it responds to any motion. This is its warm up period. After that, it will activate the sound board if any motion is detected in its field of view. Once the sound board plays out a sequence of sounds, the IR sensor will go dormant for 3 seconds (cooldown period). After this time, if motion is once again detected, the sound board will play out another sequence of sounds. This wait time functionality will keep your model from continuously playing out sounds if someone is moving around it or if it is in a crowded area.

The cooldown period can also be changed to different times. This is done via the programming button and discussed later.

NOTE: Make sure the lens of the IR sensor can "see" out of the model into free air, since this is necessary to detect nearby people. You can use a pinhole or larger hole in the model and place the sensor behind it.

SERVO MOTOR CONNECTIONS

*** DO NOT HOOK UP THE SERVOS INCORRECTLY. READ BELOW FIRST ***

The servo connections are standard 3-pin gold fingers. Make sure the black/brown wire (ground) from the servo is plugged into the pin furthest from the board edge, as shown in the below figure. The yellow/orange signal wire for the servo is connected to the pin closest to the board edge. ***The board is labeled with a "-" sign and a signal label "s" to help you with correct polarity.***

You can use any standard hobby servos, as long as the current draw does not exceed 0.5A under load. The onboard regulator is only capable of this current capacity.

The antenna stalks could use a sub micro servo in the 5-9g range. Some servo examples for use with the antennas: Hitec Hs-55, HobbyCity HXT500, HXT900, Cirrus CS201.

If the head has weight to it, consider a larger standard hobby servo such as a Hitec HS-77BB or Futaba S3003. Servos can be found at online retailers such as www.towerhobbies.com, www.hobbypeople.net, www.hobbycity.com,

When the servos are connected, they will only move (and be energized) during sound playback. When a probot talking sound is played back, the antenna servos will raise and lower automatically before and after the sound playback. This antenna movement does not happen for every sound, as it is a random event.

The head servo will also move randomly when sounds are played back. It does not always move for every sound and is only energized during this time. This implementation cuts down on excess current draw and servo chatter/whining noises when the model is sitting idle.

During install of the servos and mechanical linkage, you can also reverse the antenna servo up and down direction using the onboard programming button. This will be described next.

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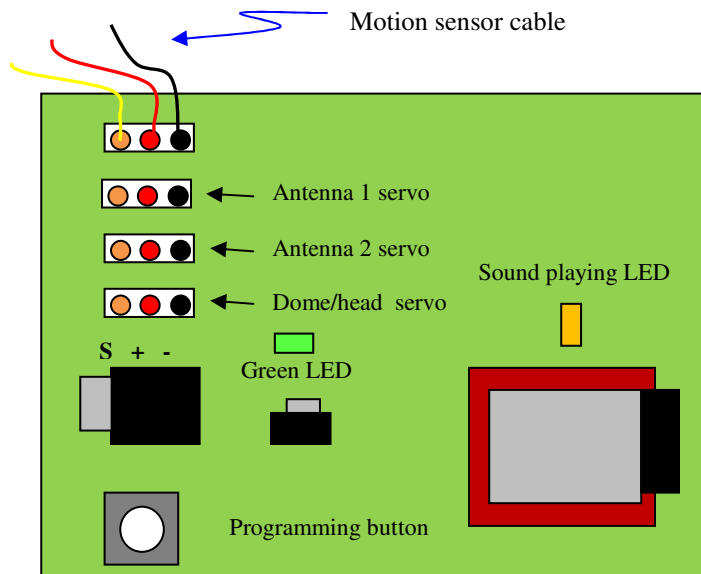
Fig.1 - Servo connections on PD board (top shown)

ONBOARD LEDS

There are two onboard SMT LEDs. The one nearest the sound module (red or yellow) will come on whenever a sound is currently playing. The green LED is a status light. It will blink 2x when the board boots up. It also lights up as long as you press the programming pushbutton.

PROGRAMMING BOARD SETTINGS

The onboard pushbutton allows you to customize several settings. The settings are changed by holding in the pushbutton a certain amount of time and then releasing it.

The settings you are able to change on the board are as follows:

- Changing the cooldown period between sounds (in sec)
- Changing between motion sensor mode and timer mode
- Reversing the antenna servo outputs
- Changing eye LED from fading to always on
- Resetting all parameters to factory defaults

For most of the settings, the board will respond with a voice annunciation informing you of the new setting. These voice sounds are also stored on the microSD card.

Below is a table of the settings you can change and the length of button press needed to access that setting:

NOTE: To aid the user in counting the correct time when changing a setting, the onboard LED will blink after each second while the button is pressed. This makes it easier to count each second to match the elapsed time with the setting (listed in the below table) you are attempting to access.

Setting	Hold button down for	Board responds with…	Value range	Default value
Increment the cooldown period before playing another sound	Less than 1 sec	New cooldown period in sec – voice annunciation	3 sec – 300 sec	3 sec
Change between motion sensor mode and timer mode	1 – 1.5 sec	New setting voice annunciation. • Motion sensor mode - plays sound back when motion detected and cooldown period passed. • Timer mode - plays sound back every cooldown sec	Motion/timer	motion
Reverse the antenna servo direction	2 – 3 sec	New setting voice annunciation. Use if servo install requires up/down direction of antenna servos to be reversed	Normal/reverse	Normal
Enable eye LED to be always on or fade with sound playback	4-5 sec	Eye LED turns on or off • Eye LED always on • Eye LED fades on/off when sound playing	Fade/always on	fade
Set the frequency of the head servo activating during sound playback	6-7 sec	New setting annunciation	Low, med, hi	Hi
Set the minimum slew of the head servo during playback	8-9 sec	New setting annunciation	Low, med, hi (150, 300, 650ms)	Hi
Reset to defaults	Over 10 sec	Settings reset, voice annunciation and board reboots		

Table 1. – Changing board settings

CHANGING SOUNDS ON SD CARD

You can change the sounds on your microSD card using a computer that can access the card and using a capable audio editing program. The files are stored in .ad4 format. The sounds programmed are as follows:

0000.ad4 – ESB probot transmission talk
0001.ad4 - antennas going down
0002.ad4 - blasters fire
0003.ad4 – thrusters activating
0004.ad4 - probot talk alternate
0005.ad4 - probot talk alternate 2
0006.ad4 - probot hover
0007.ad4 - probot transmit shield gen ESB
0008.ad4 – ESB probot self destruct scene

Note that for sounds 0, 4, 5 the antenna servos will raise and lower randomly before and after the sound playback. Also for these sounds, the probot thruster sound can also play out last – emulating the ESB scene of the probot leaving the area after transmitting its signal.

For sounds 2, 8 the blaster LED is also synchronized to the playback file blaster sounds.

You can change any of the sounds to your liking knowing the above. It is recommended to change sounds 2, 6, 7 as they have no other coupling to synchronized antenna servos, blaster LED, etc. You can also change 0, 4, 5 to other voice transmission sound effects and keep the antenna functionality.

CREATING A NEW SOUND

To create a new sound, you will need to take a wav or mp3 file and convert it to a mono 16-bit file. Programs such as Audacity or GoldWave free audio editors can do this.

Then you can save this modified file and run it through the AD4 software encoder program described here: http://www.4dsystems.com.au/prod.php?id=74

The zip file for the tool is here:
http://www.4dsystems.com.au/downloads/Software/SOMO-14D%20Audio%20Converter/4D-SOMO-Tool.zip

Please read the instructions for using the software tool.

Once you have the .ad4 file you can rename it appropriately and copy it to the SD card. NOTE: It must be named xxx.ad4, where xxxx is the number of the file.

Other .ad4 files on the microSD card that are numbered 0250 and above are for the setting annunciations and should not be changed.

ADD-ON 1W AMPLIFIER

We also offer an optional 1W amplifier board that plugs into the sound board for louder output. The board has a silver small pot in the middle of the board. This is for increasing/decreasing volume. You can use a small jeweler's screwdriver to change the volume of the output sound.

The amplifier simply connects into the 6 pin header on the controller board.

Note: If you want to disable the speaker for certain sessions but keep everything else working, you can either mount the amp in your PD with an access hole so you can use a screwdriver to lower the volume when you like. Or you can cut one of the wires going to the speaker and install an inline switch that is accessible.
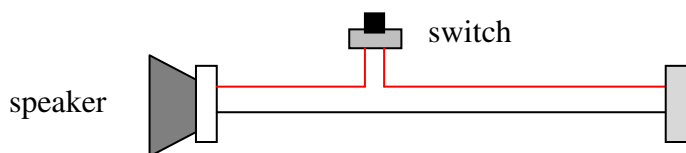
POWER SUPPLY

The sound board runs on batteries. You can use a 9V battery, a 6AA battery pack, or any other DC source in the range of 8-18V. The 6AA battery pack will last much longer than a single 9V. If you do use a 9V, consider a lithium or rechargeable nickel-metal hydride battery for extended battery life.

You can also use an AC "wall wart" adapter if you want to plug the board into the wall. Make sure the AC/DC wall adapter is 8-12V and can deliver up to 600mA of current.

INSTALL

You can use hot melt glue to secure the board and other components inside your model, as hot glue is not conductive and provides adequate protection. Try to handle the PC boards by the sides and do not directly touch the components on the board.

SPEAKER SELECTION

You can use any type speaker with the sound board, we recommend a 4-8 ohm speaker capable of handling at least 1W for best results. Smaller speakers may crackle if they receive too much power. Proper speaker selection also involves mounting it in your prop – you want the cavity to create a sound chamber which will increase the speaker's volume.

AC ADAPTER ADD ON

You can also power the board using our AC adapter kit. Just plug the power adapter cable 9v snap to the 9v snap coming off the PD board. Then plug the other end (jack) into the AC adapter's DC plug.

Here is a simple example on how to make your own wall adapter power attachment:

Snap Attach

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DC plug
and jack

Power adapter cable
(w/ 9V snap)

9v snap on
board

DC wall
adapter
power
wires
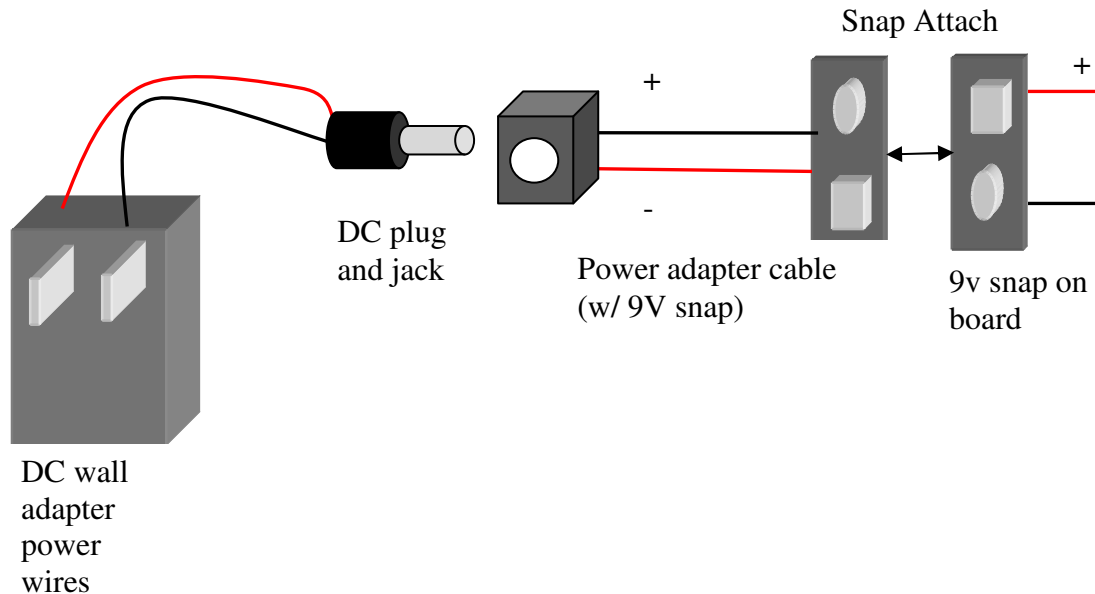
Electronic Specifications

Unit dimensions: 2" L x 1.8" W x 0.7" H
Speaker: 1-2.5" diameter, 4-32 ohm,
Audio output power: 250mW (1W w/ optional amp)
Input voltage: 6-14V DC
Current consumption: up to 500mA when servos active (load dependent), 10mA when board idle

NOTICE: There is no warranty on kits. It is your responsibility to install the board. Opened kits cannot be returned. Be careful if you use a battery source that is capable of delivering a lot of current. Contact a professional if you need assistance. Hyperdyne Labs assumes no responsibility for the misuse of this kit or any damage due to improper installation. This guide is only one way to do the install and does not represent all methods. Use at your own risk!!