

Remote Terrestrial Solar-Powered Audio Monitor

1. Overview

The remote audio monitor design was undertaken to allow us to monitor bird songs in our local sanctuary without having to run cables and power, thereby disrupting their environment.

The remote monitor consists of an off-the-shelf audio transmitter (as employed by performing artists), a 12VDC/150mA solar panel, a photocell (to shutdown during the night hours), and a power regulation and control circuit. It is packaged together in one unit designed to mount on a standard 4x4 post and is fully weather tight.

Acoustically, the transmitted audio has a full audio bandwidth (30Hz to 16KHz), though the internal compander does provide a small amount of distortion in its compression and expansion scheme. The transmission range for the unit is roughly 1000 feet, making it ideal for a lab environment.

2. Fabrication

2.1. Solar Panel Angle Determination

You will also need to determine the optimal *insolation angle*. Often this information is available from the solar panel instruction sheet, provided you know the latitude of your location. For example, at Ithaca, NY (latitude of ~42.5 degrees), the insolation angle we employed is ~50 degrees. Once this is known, make the necessary adjustments to the enclosure design and begin fabrication

2.2. General construction

Refer to the attached electrical and mechanical drawings as a basis for your design. The use of (gray) PVC sheet was selected due to the good insulation & weatherability as well as for ease of construction.

The transmitter unit will need to be modified slightly. This includes the fabrication of the battery adapter (ref. drawings), and a small cutout in the battery door edge for the adapter's wires to pass through. The transmitter unit itself is mounted employing the mount holes in it's case.

Because the wind noise will be a factor, we employed not only the (foam) wind screen that came with the transmitter, but we also added a stainless steel cooking sieve over that to further reduce the wind effect. The latter was adhered to the enclosure by silicon RTV.

A 1/8" rubber sheet was employed between the enclosure and the mounting post to provide nominal vibration isolation (e.g. from wind buffeting, etc.)

2.3. Final Configuration

Charge the internal battery fully. Adjust the internal transmitter level to just below maximum and verify the operation of all components. Adjust the remote receiver to just below the maximum level settings and verify that it receives the transmitter's signal.

3. Installation

3.1. Site Selection

Select a site that has relatively good sunlight during the greatest part of the day, as well as one that is not blocked by vegetative growth during peak growing seasons.

The mounting posts employed were pressure-treated 4x4s, set ~3' deep (we were installing these on islands in the middle of a wetland area). The posts need to be orientated such that the mounted unit will face south.

If you expect to have a bird congregation problem (and hence the mess covering the solar panel), you may want to drive nails into the top of the post such that they cannot sit there...

3.2. Setup / Takedown of Remote Audio Monitors

- 1) Using rubber gasket, mark and drill post for bolts. Using a 3/16" drill bit, drill a hole for each of the four bolts. Secure bolts into holes. Place gasket over bolt pattern.
- 2) Remove battery and mount unit to post using rubber washer, steel washer, locknut and wingnut (4 places).
- 3) Un-tape battery spade lugs and connect the battery.
- 4) Turn on transmitter power and audio.
- 5) Thread antenna through bottom panel. Now mount and secure bottom panel (6 screws).
- 6) Pull antenna tight and secure (e.g., with tape).

To take down unit, reverse above steps. Note that the battery MUST be disconnected and the spade lugs MUST be taped up when taking the unit down.

4. Operational Notes

The battery life is approximately 25 hours. The circuit has a photocell that only allows it to be powered up during hours of light, unless the bypass switch is engaged (e.g. for night-time recordings).

Appendix A. Parts Lists

Wireless Microphone System #7500B-B Altec-Lansing
Phone: 405.324.5311, Fax: 405.324.8981
Solarex SA-2 Module Digikey

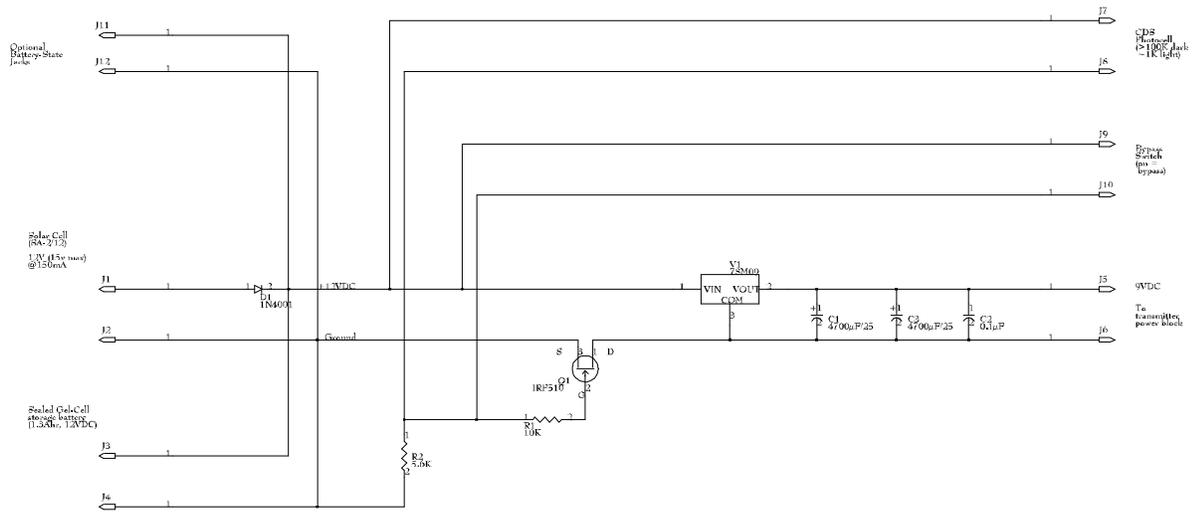
CDS Photocell (>100K Ohm dark, ~1K Ohm light) Radio Shack
IRF510 Power MOSFET Radio Shack

1.3Ahr Sealed Battery, Panasonic LC-R121R3PU Digikey

2" Stainless-steel cooking sieve

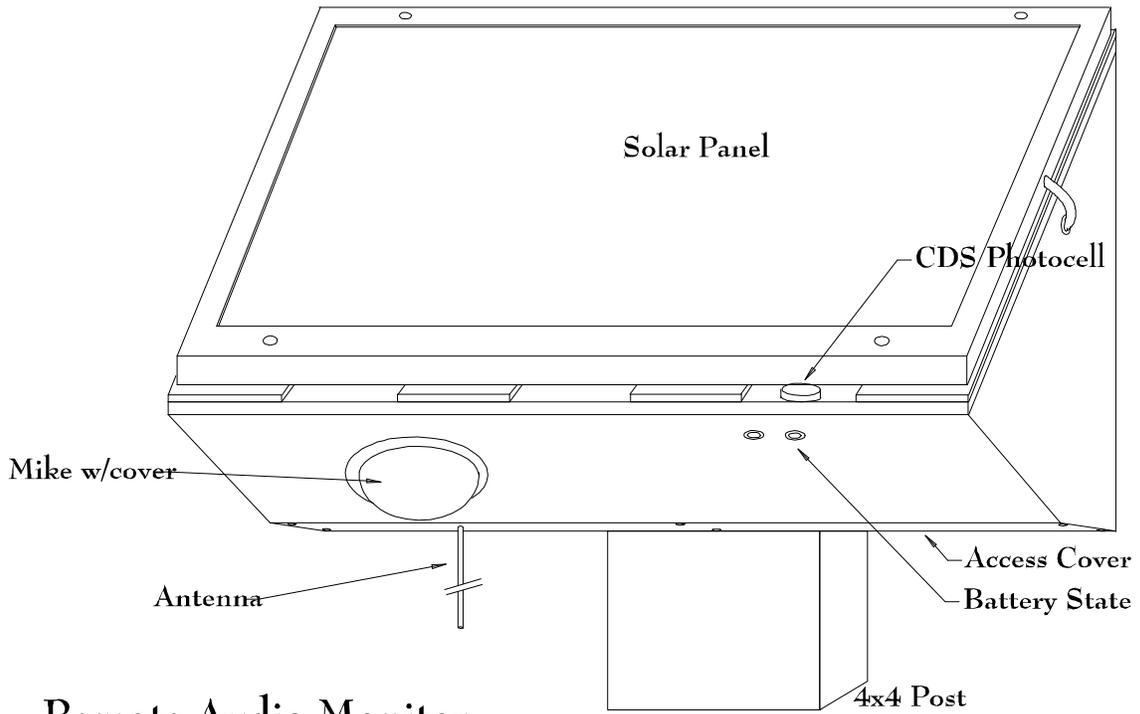
Further electronic and mechanical components per the drawings...

Appendix B. Electrical Schematics



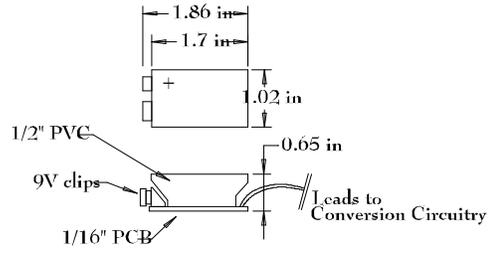
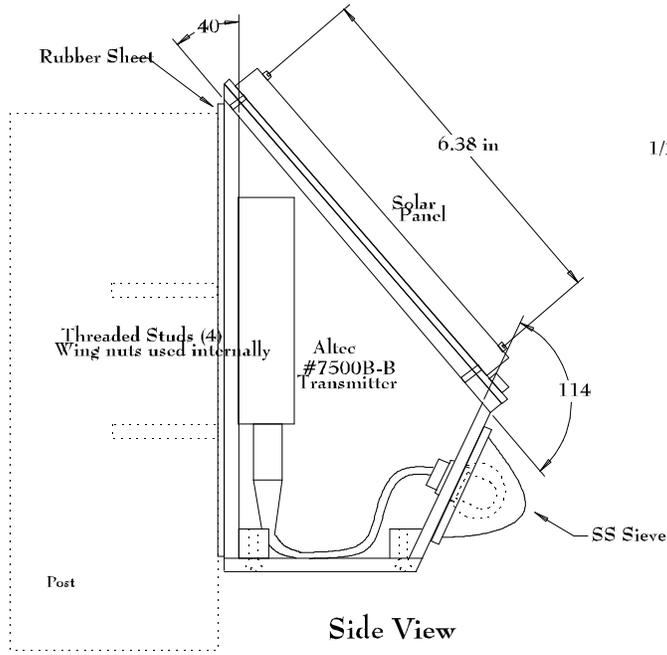
Remote Transmitter Control Circuit
 Consumption ~ 4.5mA (transmitter, etc.)
 w/o charging considerations

Appendix C. Mechanical Drawings



**Remote Audio Monitor
Exterior Detail
Scale = 1:2
Cornell Bioacoustics**

Material = 1/8 & 1/4" Gray PVC S



Transmitter Battery Adapter

**Remote Audio Monitor
Interior Details
Scale = 1:2
Cornell Bioacoustics**

Material = 1/4" Gray PVC Sheet