

For tools, I'd look locally @ A-1 Electronics and/or Radio Shack. I'd recommend For parts & supplies, I'd recommend or ordering from All Electronics Sameco.

Appendix C

TOOLS AND MATERIALS NEEDED

This is a list of the essential supplies needed to do the projects in this book. Most can be obtained from a variety of sources. I have listed online outlets that stocked the parts at reasonable prices as of December 2005. Be advised that the stock of "surplus" retailers can fluctuate wildly, when the specified part vanishes, however, there's often an acceptable alternative available from the same vendor. Most of the designs are forgiving of a wide range of component variation and substitution; those few items that are critical and should not be substituted without due care and attention have been noted in the list. You should be able to pick up all the needed parts for under \$50; tools might set you back another \$25-\$50.

I have not specified in this list all the scrounged objects, such as tape heads, and loudspeakers, as these are best hunted locally, following the advice in specific chapters.

Source Key

The four major sources for the materials needed are indicated as follows:

- AE = www.allelectronics.com (All Electronics)
- J = www.jameco.com (Jameco)
- RS = www.radioshack.com (Radio Shack)
- MPJA = www.mpja.com (Marlin P. Jones)

Within Europe the major source is:

RS Components = <http://rswww.com>

Tools

The tools needed to do the projects in this book are:

- Good soldering iron, with as fine a tip as possible; 15-60Watts.
- Roll of "rosin-core" electrical solder (not "acid core" solder, which is used for plumbing and metalwork).
- Battery-powered amplifier
RS: 277-1008, \$12.99

Or an amplifier kit, with a scrounged speaker added:

- MPIA: Kit 17, #6017KT, \$4.06
- MPIA: Kit 27, #6027KT, \$4.69

- Assorted patchcords to connect to amplifier from various jacks.
- Prototyping breadboard:
 - AE: PB-400, \$3.00
- Inexpensive digital multimeter (voltage, resistance, current).
- Small diagonal wire cutters, suitable for light gauge wire.
- Simple wire strippers, suitable for light gauge wire.
- Set of small screwdrivers (sometimes called "jeweler's screwdrivers"), flat and Phillips tips, suitable for opening electronic toys, portable radios, etc.
- "Sharpie" style fine-tipped permanent marker.
- Roll of insulating electrical tape.
- Flashlight.
- Small saw for plastic and metal.
- Double-stick tape.
- Files.
- Electric drill and bits.
- Small spring clamps or clothespins (nonconductive: plastic or wood, not metal).
- Scissors.
- Utility knife.
- Swiss Army knife—always useful.

Parts and Supplies ← get all of these

Additional parts and supplies needed to work on projects in this book are listed below. Just to be on the safe side, always pick up a spare or two especially if the part is cheap. All costs are approximate and are listed in US dollars.

Pcs = pieces (each number of pieces needed will be specified). Where two prices are separated by a "/" the first number equals the cost for 1-10 pieces; the second equals the cost for 10-100 pieces (i.e., \$0.35/0.30).

- Insulated wire, 22-24 gauge, stranded, approximately 20 feet.
- Insulated wire, 22-24 gauge, solid, approximately 20 feet.
- Shielded audio cable, 1 conductor + shield, lightweight (as thin as possible), approximately 20 feet.
- Can of "Plasti-Dip" tool handle insulation paint; \$13.00.
- Plastic terminal barrier strip, 1 piece.
 - AE: TB-20, \$2.10
 - RSUK: 725-061
- Sheet of antistatic foam (used for packaging Integrated Circuits).
 - J: 13864, \$7.95 (1pc 24"x 12" x 1/4")
- 5: 1/8" (3.5mm) male plugs (if you are using an amplifier with 1/8" input and output jacks—otherwise select appropriate jacks for your amplifier).
 - AE: PMP, \$0.35/\$0.30
 - RSUK: 449-994

5: 1/8" (3.5mm) female jacks (or 1/4" female jacks if you are working with that standard)

- AE: MJW-8, \$0.30/\$0.20
- RSUK: 454-249
- 2: piezo disks (1.36")
 - AE: PE-35, \$0.75/\$0.50
 - AE: BST-3, \$0.25/\$0.15
 - RSUK: 489-021
- 10: test leads with alligator clips at each end
 - AE: MTL-10, \$2.50/10 pcs
 - AE: TPX-1, \$1.50
- 1: audio output transformer
 - RS: 273-1380, \$2.99 (this part is difficult to find from any other vendor)
- 6: 1.0 megOhm linear taper potentiometers
 - J: 29065, \$0.99/\$0.79
- 4: audio taper potentiometers
 - 10kOhm: AE: ATP-10K, \$0.50
 - or 20kOhm: AE: AP-20K, \$0.50
- 6: photocells
 - J: 120310, \$1.20/\$1.09 (this is a very good, wide range part, preferable to most others I've found)

Resistor Assortment, common values (most important values are 1k, 2.2k, 10k, 100k, and 1 meg—if you wish to buy them something less than a full set get 10 of each of these).

Capacitor assortment; most values are not critical. Any general purpose capacitor assortment that covers this range will do:

- 10: 10pf; J: 15333, \$0.07/\$0.06
- 10: 100pf; J: 15341, \$0.05/\$0.035
- 10: 0.01uf; J: 25507, \$0.09/\$0.06; RSUK: 829-586
- 10: 0.1uf; J: 25523, \$0.07/\$0.06; RSUK: 829-615
- electrolytic caps
 - 10: 1.0uf; J: 29832, \$0.057/\$0.048; RSUK: 324-5543
 - 10: 10.0uf; J: 198838, \$0.045/\$0.03; RSUK: 324-5593
 - 10: 47uf; J: 31114, \$0.06/\$0.05; RSUK: 324-5492
- 6: LEDs
 - J: 152864EF, \$0.24/\$0.19
- 6: small signal diodes (1N914 or equiv.)
- 1: phototransistor
 - J: 112168, \$0.30/\$0.24

3: 74C14 Hex Schmitt Trigger Integrated Circuit (all Integrated Circuits should be "dual in-line package," not "surface mount").

These MUST NOT BE 74AC14 or R HC14, ONLY 74C14!

J: 44257, \$0.35/\$0.31

- 3: CD4093 Quad NAND Schmitt Trigger Integrated Circuit
 - J: 13400, \$0.25/\$0.19
 - RSUK: 345-5728
- 2: CD4040 Binary Divider Integrated Circuit
 - J: 12950, \$0.29/\$0.19
 - RSUK: 345-5475
- 2: CD4049 Hex Inverter Integrated Circuit
 - J: 13055, \$0.24/\$0.21
- 1: LM386N-3 Power Amplifier Integrated Circuit
 - J: 24133, \$0.59/\$0.49
 - RSUK: 414-6318
- 1: 8 pin DIP IC socket
 - J: 51570, \$0.07/\$0.06
- 4: 14 pin DIP IC socket
 - J: 112213EF, \$0.10/\$0.075
 - RSUK: 402-765
- 2: 16 pin DIP IC socket
 - J: 112221EF, \$0.13/\$0.115
 - RSUK: 402-771
- 1: PC board
 - R: 276-0170, \$2.99
- 2: 9-volt batteries for circuit breadboarding
- A portable radio (see chapter 11).
- An electronic toy (see chapter 12).
- Batteries for radio and toys, as needed.

Appendix D

THE RULES OF HACKING

- Rule #1: Fear not (chapter 2)!
- Rule #2: Don't take apart anything that plugs directly into the wall (chapter 2).
- Rule #3: It is easier to take something apart than put it back together (chapter 2).
- Rule #4: Make notes of what you are doing as you go along, not after (chapter 2).
- Rule #5: Avoid connecting the battery backwards (chapter 2).
- Rule #6: Many hacks are like butterflies: beautiful but short-lived (chapter 2).
- Rule #7: In general try to avoid short circuits (chapter 2).
- Rule #8: In electronics some things are reversible with interesting results, but some things are reversible only with irreversible results (chapter 4).
- Rule #9: Use shielded cable to make all audio connections longer than 8" unless they go between an amplifier and a speaker (chapter 7).
- Rule #10: Every audio connection consists of two parts: the signal and a ground reference (chapter 7).
- Rule #11: Don't drink and solder (chapter 7).
- Rule #12: After a hacked circuit crashes you may need to disconnect and reconnect the batteries before it will run again (chapter 13).
- Rule #13: The net value of two resistors connected in parallel is a little bit less than the sum of the two resistors; the net value of two resistors connected in series is the smaller of the two resistors (Ohm's Law for Dummies; chapter 14).
- Rule #14: Kick me off if I stick (Zammo's rule; chapter 14).
- Rule #15: You can always substitute a larger 1.5-volt battery for a smaller one, just make sure you use the same number of batteries, in the same configuration (chapter 17).
- Rule #16: It's always safer to use separate batteries for separate circuits (chapter 17).
- Rule #17: If it sounds good and doesn't smoke, don't worry if you don't understand it (chapter 18).
- Rule #18: Start simple and confirm that the circuit still works after every addition, you make (chapter 18).
- Rule #19: Always leave your original breadboard design intact and functional until you can prove that the soldered-up version works (chapter 19).
- Rule #20: All chips may look alike on the outside without being the same on the inside—read the fine print (chapter 20)!