

The Tennessee Music Box Project

By Dave Murray 2003

Objective

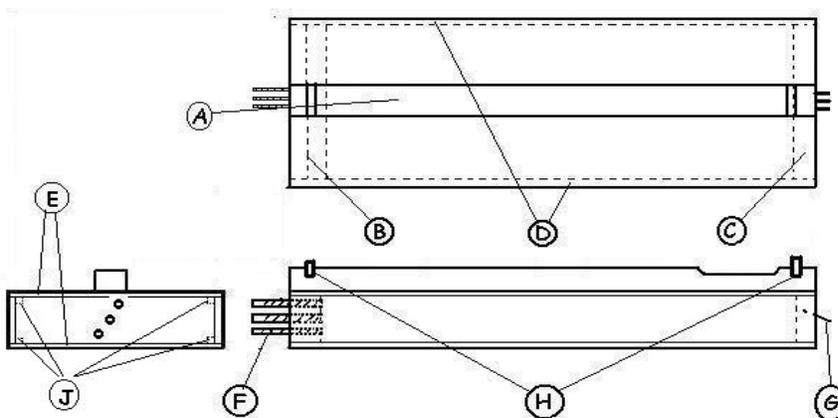
The objective of this project is to bring music, and the mountain dulcimer, to as many people as possible by providing plans for a very inexpensive and easy to build Tennessee Music Box.

The cardboard dulcimer is a popular and inexpensive dulcimer that is often used for class rooms, but when they come from a commercial source there is a mark-up that raises the price. The price of these commercially available cardboard dulcimers is very reasonable and if your time is worth more to you than the small amount of money that makes up the labor and profit, then they are to be recommended. For people on a very tight budget, or those who just wish to put something of them self into the dulcimers, the home made Tennessee music box might be a good way to go. Two fret board options and three tuner options are provided.

These plans assume that the builder has some knowledge of what a mountain dulcimer is and can use common hand tools. They also assume that the builder is capable of making some decisions where room for choice is given. The parts list goes from "simple and cheap" to "this will be a nice instrument".

READ AND UNDERSTAND THE INSTRUCTIONS COMPLETELY - BEFORE YOU START!

The Basic Design Drawing



Design Options

MOF / FF (Melody Only Frets / Full Frets)
PB / EPB (Plain Box / Extended Peg Board)
ST / MT (Screw Tuners / Machine Tuners)

Parts Identification For Basic Drawing

Call	Item	Details / Materials
A	Fret Board	See detail A 1" x 2" x 36" hard wood (3/4 x 1 1/2 dressed) Fret board stock from supply house .
B	Peg head board	Double this for sufficient thickness to prevent tuning screw slipping. 1" x 3" x 21" hard wood (3/4 x 2 1/2 dressed) [for B & C]
C	Tail board	Thick enough to support pull of strings on nails.
D	Side boards	Can be thin if kerfing is used. 1/4 plywood - non-critical Side board stock from supply house
E	Sound & bottom boards	Thin enough to vibrate well. cardboard (cheapest) 1/8" door skin (cheap) sound and bottom board from supply store
F	Tuning screws	(3 ea) 1/4 x 3 wire tie screws (cheap) tuning machines from supply store
G	String attachment nails	Small head or grind heads off.
H	Nut & bridge	Something hard, but not something that will eat away the strings. plastic (not recommended) hard wood bone delrin from supply house corian scrap or samples
J	Kerfing	Strips of wood glued to side boards to increase glue surface for sound and bottom boards.
K	Strings	See chart .

Assembly Instructions

Step

Instruction

- 1 Decision time - Style** - Tuning machines are easier to tune and if they fit into the budget they are a good idea. If you have never built a mountain dulcimer of any kind before it might not be a bad idea to plan for the first one that you make to be a wall hanger and go the cheap screw tuner route for an inexpensive learning experience, even if you plan to ultimately build *deluxe* ones with good tuning machines. **Size** - For young children, a 24" string length is probably a good choice. A 26" is comfortable for most people to play. A 28" might be difficult for people with small hands, or limitations, to play chords, but a larger dulcimer will likely have more volume, and better bass. **Quality/Cost** - A Tennessee music box can potentially be a quality instrument, but quality costs. A wide range of trade-offs can be made to keep costs down. The purpose of this project is inexpensive dulcimers, but a very nice instrument can also be constructed for a lot less money than buying a dulcimer.
- 2 Get materials** - Fret wire and tuning machines are not available at your local hardware store and you will probably need to order them by mail. If you are going to buy any components from an instrument supply company, you *might* want to also consider getting nut and bridge, a good, straight, hardwood fret board, and a good quality sound board while you are at it, if this is to be a high quality instrument.

If you are going for inexpensive then you can get all but fret wire and tuning machines at your local home builder and or craft store. Buy wood with minimum waste in mind. You'll be paying for it by the foot. For your fret board stock, get the straightest wood possible.

- 3 Cut materials to size** - Since assembly time is stretched out by waiting for glue to dry, it is not essential to precut everything, but it is a good idea.

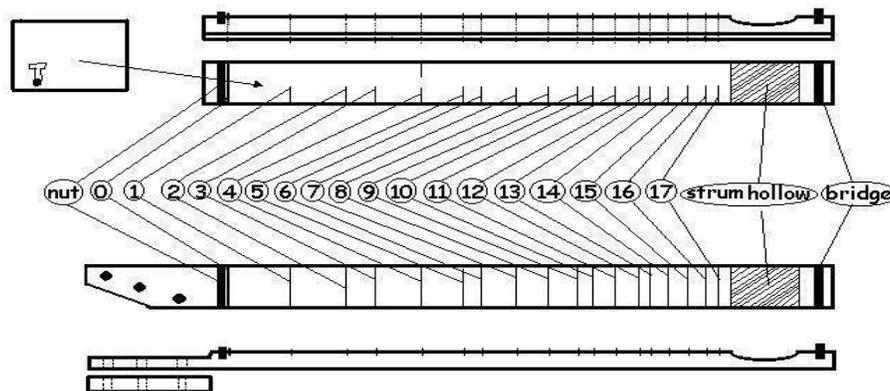
You'll notice that I did not provide dimensions in the basic diagram. It is not an oversight, the size is up to you. Since you can get plenty of volume by making the sides deep, it is probably best to make it no wider than 8", but a wider one, even wide enough to make a courting dulcimer is OK. For a small 24" fret board for young children, a 6-7" width is probably ideal. **Note** that the side boards are attached to the ends of the peg head and tail piece boards so the side board width must be added before cutting the sound and bottom boards. Cut them a little wider than that so they can be sanded down flush with the sides so they can be smooth and splinter free. **Also note** that the bridge is actually a bit farther from the nut than the theoretical string length. Also, if you are putting a 0 fret and the bottom of the slots in the nut will be lower than the frets than additional space must be provided. You will need to leave some wood extending past the cuts for the nut and bridge for strength, so the length will be a couple of inches longer than the string length. For a 26" dulcimer, you actually will have a 28" overall length for the fret board, sound, bottom and side boards. **Important** - If you are building with tuning machines or an extended peg head design with screws, add about 5" more to the length of the fret board.

- 4 Prepare fret board** - The fret board is the most critical piece and the adage measure twice, cut once is especially important here. See detail A, and the fret chart. Measure and mark the fret board. If you are making a 24" child's dulcimer, you might only put frets out to position #15 since 16 & 17 will be too close together to be useful. Cut, or grind, the strum hollow. Fret boards are often routed out on the underside, but I don't recommend it for these inexpensive, easy to build dulcimers.

If you are making the **extended peg head**, cut to shape as shown in detail A and drill for tuning machines or screws. If you are using **screws**, drill small holes to prevent wood splitting but not so large that the screws do not get plenty of *bite*. Cut slots, saw and small chisel, for nut and bridge if you do not plan to empirically set the intonation. If you plan to fine tune the intonation, only cut out the nut slot at first. See the Bear Meadow web sight for details on intonation.

- 4a **Bent over nails option** - Drill holes (very nearly the diameter of the nails) one nail diameter away from the edge of the fret board. If you are using a wood sound board, glue the fret board to the sound board (down the center), weight it and let it dry to set. If you are using cardboard, do not glue it on now since it will be crushed when the fred nails are driven in. Place the fret board (with sound board if applicable) over a scrap piece of wood. Drive the nails through the fret board and into the scrap wood so there is enough nail not driven in to bend over 1/3 of the fret board. [driving the nails into the scrap wood is to give support during the bending process so that the fret board is not split. You should also put one nail fret for the bass string at fret 4 so the instrument can be self tuned. There is no need for *extra frets* with this model since it will most likely be tuned I-V-V. This is recommended for using the dulcimer to teach music.
- 4b **Fret wire option** - use a miter and fret saw to cut the slots for the frets where you marked-up the fret board. **Press** fit the frets. Cut slots for nut and bridge (see comments on intonation before cutting the bridge slot). If you don't know about installing *extra frets* at the 6+/13+ and or 1+/8+ positions, I recommend that you read about their purpose on my webpage (link at the end of this article). If your purpose is to dulcimers for young music students, you can leave them off and tune I-V-V and reduce confusion.

Detail A - Fret Board



Fret Chart - Distance: Nut (Fret 0) to Fret

	24"	26"	28"
1	2.62	2.84	3.05
1+	3.82	4.14	4.45
2	4.95	5.36	5.78
3	6.02	6.52	7.02
4	7.98	8.65	9.31
5	9.73	10.54	11.35
6	10.53	11.41	12.29
6+	11.29	12.23	13.17
7	12.00	13.00	14.00
8	13.31	14.42	15.53
8+	13.91	15.07	16.23
9	14.47	15.68	16.89
10	15.01	16.26	17.51
11	15.99	17.32	18.66
12	16.86	18.27	19.68
13	17.27	18.70	20.14
13+	17.64	19.11	20.58
14	18.00	19.50	21.00
15	18.66	20.21	21.76
16	19.24	20.84	22.44
17	19.50	21.13	22.76
Bridge (See note)	24.24	26.24	28.24

Assembly Instructions (continued)

- | Step | Instruction |
|------|--|
| 5 | Frame assembly - Glue and clamp the side boards to the head and tail pieces. After it has set, if the side boards are thin (recommended) glue some 1/2" square strips to the side boards flush with the bottom and top to provide additional surface for gluing the bottom and sound boards to. They also stiffen the entire structure for added strength. If you are putting the tuning screws directly into the head piece, glue two pieces together to provide plenty of wood for good friction (second piece inside the frame). |
| 6 | Attach bottom board - Glue the bottom board to the frame with a bit extending beyond the edges to be sanded down latter. If you are using cardboard for the bottom and sound boards, cut them exactly to size and put some fake wood self sticking shelf paper on the side that will show with a bit wrapping around the edges to dress them, before gluing them to the frame. |
| 7 | Attach sound board - If the fret board is not already attached to the sound board, glue it on now. Drill/cut the sound holes before gluing the soundboard to the frame. |

If you are building the extended peg head for screw tuning pegs, it's time to glue another piece of wood to the bottom of it if it is not thick enough to give a good friction bite if you haven't already done it. Extend the undersized pilot holes into the new wood.

- | | |
|---|--|
| 8 | Sand it down - Time to take off the rough edges. |
| 9 | Install tuners and nails in the tail piece - Insert the nut and bridge. String it up. |

Screw eyes with coarse pitch slipped, use 1/4" x " wire ties if you are using screw tuners.

Note: The bridge goes a little farther out than the theoretical string length. Errors in placement will cause the notes to go progressively more flat or sharp as you work your way along the fret board. It is a good idea to find the right spot with a temporary bridge before cutting a slot for it. See the Bear Meadow web page for instructions on setting up intonation (link at bottom of this article).

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|----|---|
| 10 | Tuning - The most common tunings for mountain dulcimers are DAa and DAd. D=bass A=middle A/D=treble. The chart that follows gives recommended string gauges for these tunings. |
|----|---|

String Gauge Chart

	24"	26"	28"
Bass D	24W	22W	22W
Midle A	16	16	14
Treble A	16	16	14
Treble D	12	12	10

Sundry Materials

- Wood glue
- Shellac for finishing.
- Leather scrap for ends of fret board to prevent wire from cutting into it. Also if you are using screw tuners, to cover threads to protect fret wire.
- Sand paper, steel wool, etc

Recommended Reading/Sources

Link	Name
http://www.bearmeadow.com	Bear Meadow - Information about building fine mountain dulcimers including an article on setting intonation .
http://home.centurytel.net/Dulciaddict/dulciaddict.htm	Dulciaddict - Information about building mountain dulcimers aimed at the hobbyist. This helped me build my first 'from scratch' dulcimer in so many ways.
http://www.everythingdulcimer.com/discuss	Everything Dulcimer - Discussion list for building dulcimers; ask questions.
http://www.folkcraft.com/newwood.html	Folkcraft - parts, supplies,etc.
http://www.stewmac.com	Stewart-MacDonald - parts, supplies,etc.

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