

The Dulcimer Exploded

(Copyright © 2002 by Randy "Ardie" Davis. Excerpt from Chapter 3 in "A Dulcimer Builder's Do-It-Yourself Guidebook." Contains helpful information about Dulcimer Design, Dulcimers Parts, and Hardwoods. For more information, please visit <http://www.amazon.com/Dulcimer-Builders-Yourself-Guidebook-Woodworker/dp/1553950100>)

Before cutting your first board it's a good idea to understand how the dulcimer is constructed, to understand a little about hardwoods, and to do some simple calculations.

I've listed the parts of the dulcimer below, and identified the wood and hardware needed for each part.

Following that are some illustrations of the dulcimer and pin block.

The dulcimer is constructed of the following major parts:

Rails	The rails form the frame of the dulcimer. Their primary purpose is to lend rigidity and strength to the frame.
Pin Blocks	The pin blocks are the "shoulders" of the dulcimer and must withstand the stress of the hitch pins, tuning pins and strings.
Soundboard	The primary purpose of the soundboard is to vibrate in sympathy with the strings. It provides the top of the sound chamber. The soundboard dictates the tonal quality and influences the volume of the instrument.
Bridges	The bridges serve to support and separate the strings so they can vibrate freely. The placement of the Treble Bridge also provides the "Fifth Interval" tuning for the Diatonic scale
Bottom Panel	The bottom panel provides the bottom of the sound chamber.
Internal Braces	The internal braces prevent the pin blocks from pulling together under the tremendous strain of the strings.
Bridge Supports	The internal bridge supports lie under the soundboard, directly beneath the upper bridges. The placement and construction of the bridge support can affect the volume and tone of the instrument. The bridge supports prevent the soundboard from collapsing.

In the table below I present all the components of the dulcimer, indicating how many there are, the material they are made of and any helpful comments I can think of.

Part	Qty	Material	Comments
Rails	4	Walnut (or other hardwood)	Almost any hardwood will do here.
Pin blocks	2	Laminated Maple and/or Hard Maple or Birch	If you can't get laminated Hard Maple, just use Hard Maple. If you cannot get Maple, you can use Birch.
Bottom	1	Baltic Birch plywood	You can substitute any strong laminate or solid wood.
Soundboard (Floating)	1	Western Red Cedar	Baltic Birch plywood will do if you cannot make or buy a solid top. Spruce, Redwood and Mahogany are also commonly used.
Treble Bridge	1	Hard Maple with Walnut Inlay	You can use other woods like Rosewood or Walnut.
Treble Bridge Rod	1	Delrin (acetal)	You can also use steel or brass 1/8" rods.
Bass Bridge	1	Hard Maple with Walnut Inlay	You can use other woods like Rosewood or Walnut.
Side Bridges	2	Hard Maple	You can use other dense, tight-grained woods like Rosewood.
Tuning Pins	87	Bright Steel	Also called Zither Pins
Hitch Pins	87	Iron, Nickel plated	Also called Desk Pins
Wire	87	Steel	Various gauges and lengths
Cross Brace Dowels	2	Hardwood Dowels	Make sure these are <i>straight</i> .
Treble Bridge Support	1	Poplar	Any hardwood will do, but Poplar is light and inexpensive.
Bass Bridge Support	2	Poplar	Any hardwood will do, but Poplar is light and inexpensive.
Bridge Support Dowels	3	Hardwood Dowels	Make sure these are <i>straight</i> .
Handle	1	Steel/Brass	Get one with 4" spacing between mounting holes. Standard drawer pulls only have 3" spacing.

Parts List

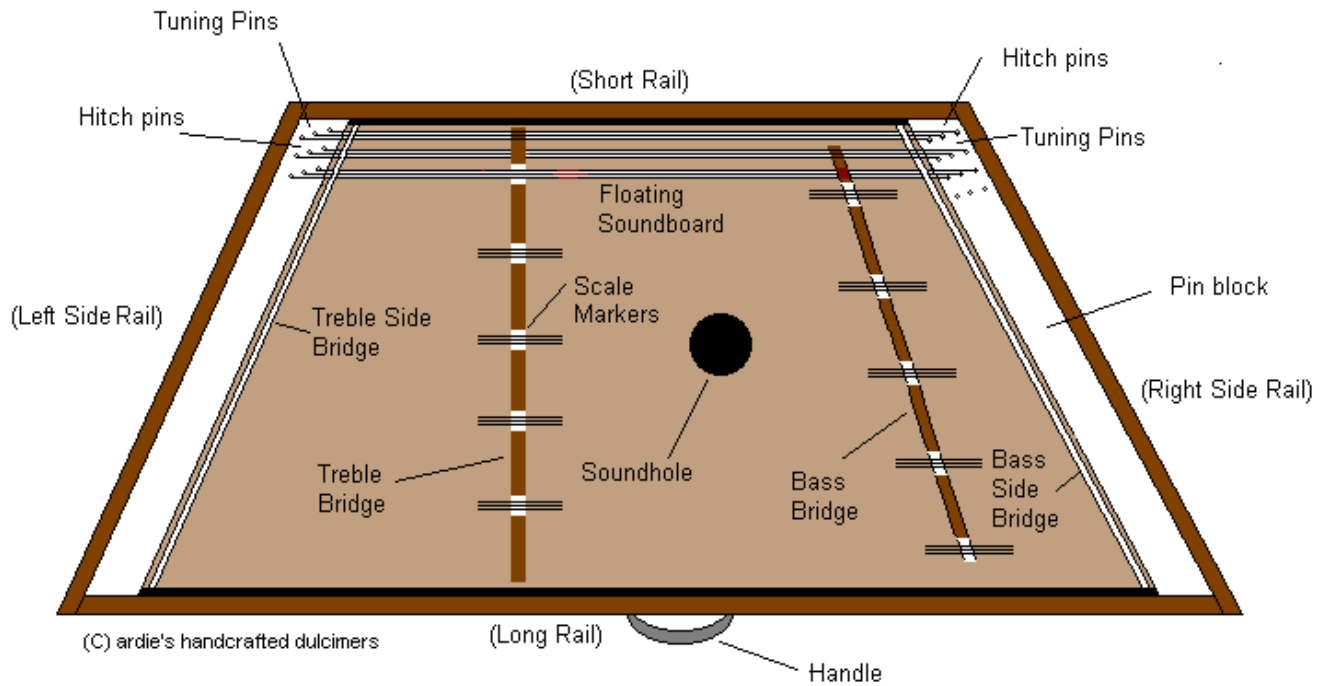
Dulcimer Components Illustrated

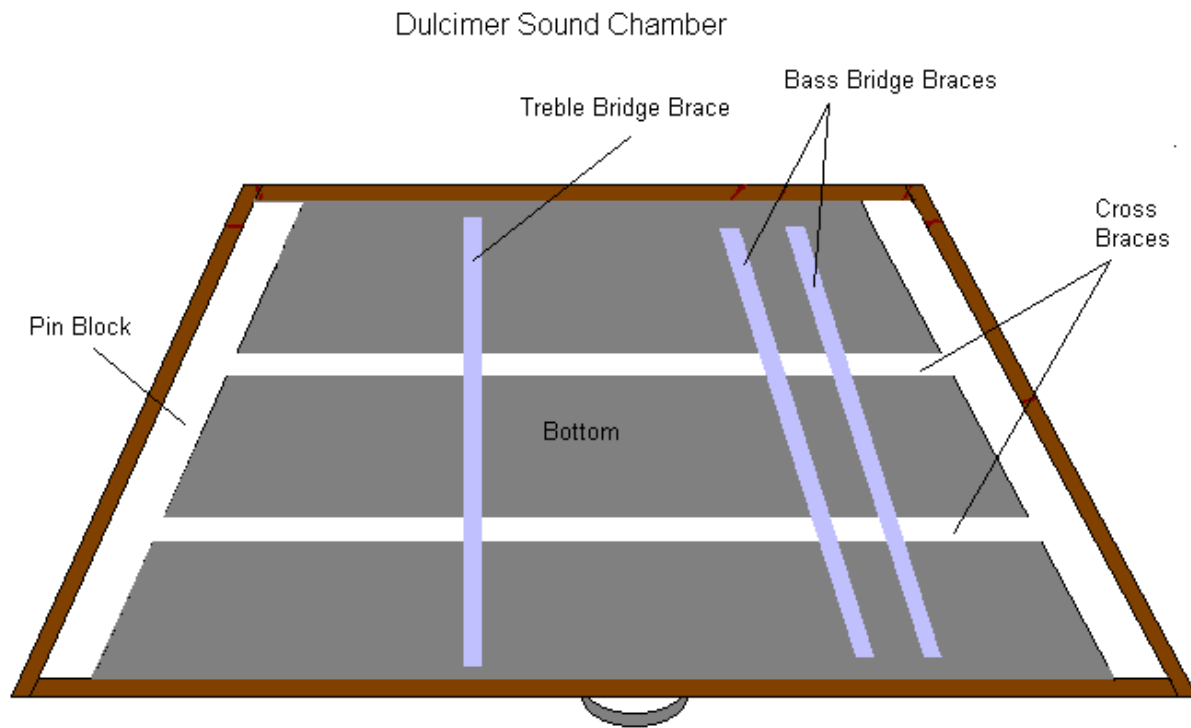
The Pin Block Illustrated (Side View)

Maker's Note

The pin block illustrated to the right shows a laminated rock maple top layer. Since most hobbyist dulcimer makers do not have access to laminated rock maple, this book assumes you will use non-laminated hard maple instead. Professional dulcimer makers use laminated rock maple for the top layer to prevent the tuning and hitch pins from splitting the pin block over time.

Diagram of a Dulcimer

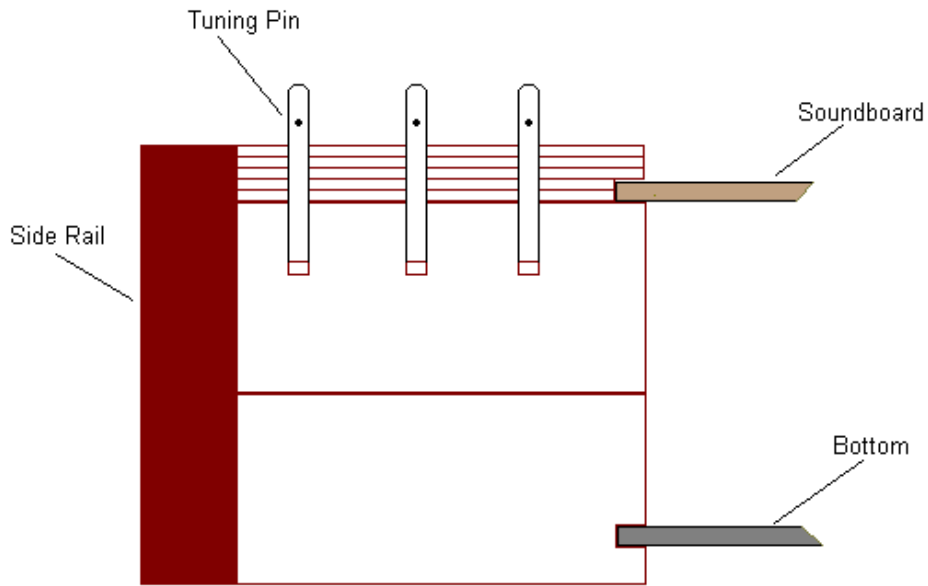




(C) ardie's handcrafted dulcimers

As you can see by the illustrations, the challenge of constructing a good dulcimer is not in its design, which is not complex, but in its subtlety, in knowing what will affect sound and tonal qualities and what is purely cosmetic.

The Dulcimer's Pin Block: End View



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Materials List

Following is a materials list that you will find handy. The list takes each part of the dulcimer and indicates approximately how much rough lumber, in board feet, or finished lumber, in lineal inches, is required for that part. The materials list also provides approximate measurements for each component of a part. For example, the soundboard, a trapezoid, is actually comprised of several planks of increasing lengths glued edgewise. The materials list will provide measurements for each plank.

Description	Material	QTY	Units	Th.	W	L	BF
Sound Board							
Sound Board – Plank 1	Cedar	1	LI	0.25	3.5	23	
Sound Board – Plank 2	Cedar	1	LI	0.25	3.5	29.25	
Sound Board – Plank 3	Cedar	1	LI	0.25	3.5	29.25	
Sound Board – Plank 4	Cedar	1	LI	0.25	3.5	35.75	
Sound Board – Plank 5	Cedar	1	LI	0.25	3.5	35.75	
Sound Board – Plank 6	Cedar	1	LI	0.25	3.5	42.5	
Sound Board – Plank 7	Cedar	1	LI	0.25	3.5	42.5	
Bottom	Baltic Birch Plywood	1	Ea	.25			
Long Frame Rail	Walnut	1	BF	0.875	4	48.5	1.18
Short Frame Rail	Walnut	1	BF	0.875	4	27	0.66
Left Rail	Walnut	1	BF	0.875	4	25	0.61
Right Rail	Walnut	1	BF	0.875	4	27	0.66
Total Walnut Board Feet =							3.10
Pin Block							
Left Pin Block Top Layer	Hard Maple	1	BF	0.75	2.5	24	0.31
Right Pin Block Top Layer	Hard Maple	1	BF	0.75	2.5	27	0.35
Left Pin Block Middle Layer	Hard Maple	1	BF	1.75	2.5	24	0.73
Left Pin Block Bottom	Hard Maple	1	BF	1.75	2.5	24	0.73
Right Pin Block Middle Layer	Hard Maple	1	BF	1.75	2.5	27	0.82
Right Pin Block Bottom	Hard Maple	1	BF	1.75	2.5	27	0.82
Treble Bridge	Hard Maple	1	BF	1	1.5	22	0.23
Bass Bridge	Hard Maple	1	BF	1	1.5	21	0.22
Left-side Bridge	Hard Maple	1	BF	1	0.75	22.5	0.12
Right-side Bridge	Hard Maple	1	BF	1	0.75	24.5	0.13
Total Hard Maple Board Feet =							4.46
Short Dowel Pin Block Cross-Brace	Hardwood	1	LI	1.25		29.50	
Long Dowel Pin Block Cross-Brace	Hardwood	1	LI	1.25		37.50	
Treble Bridge-Support Dowel	Hardwood	1	LI	0.5		20	
Left Bass Bridge-Support Dowel	Hardwood	1	LI	0.5		20.25	
Right Bass Bridge-Support Dowel	Hardwood	1	LI	0.5		20.25	
Treble Bridge-Support	Poplar	1	LI	0.75	4	20	
Left Bass Bridge-Support	Poplar	1	LI	0.75	4	20.25	
Right Bass Bridge-Support	Poplar	1	LI	0.75	4	20.25	
Delrin Rod	Delrin (acetal)	1	Ea	0.09		21.5	

* These board feet estimates for walnut and maple are approximate to what you will actually use. However, since rough lumber doesn't come in such neat measurements, you will actually end up buying more board feet than estimated here. For example, the rails of the dulcimer are 4" wide, but you will end up buying a 6" wide or 10" wide piece of rough lumber.

How Board Feet Are Calculated

Thus a board 1.25" thick by 6" wide by 96" (8') long will yield 5 board feet.

$$1.25" \times 6" \times 96"$$

$$144 = 5 \text{ bf}$$

Buying Unfinished Hardwood

If you've never bought unfinished hardwood lumber before, you will need to know approximately how many board feet of a particular hardwood you will need, and then buy the size board that will yield at least that many board feet. As a simple example, take the Long Frame Rail of the dulcimer, which is 7/8" thick x 4" wide x 47" long. This would require 1.14 *board feet*.

Maker's Note

The thickness of rough hardwood lumber is measured in *quarters*. Thus a board 1 1/4" thick is referred to as *five-quarter*. A 2" thick board is referred to as *eight-quarter*.

However, when you buy your unfinished lumber, you will likely have to buy a board that is something like 5/4" x 6" x 6', then cut, rip and plane it down to the proper size. For my rails, I usually end up with two boards: one that measures 5/4" x 6" x 6', and one that measure 5/4" x 6" x 8'. Two boards of these dimensions actually contain a total of 8.75 bf.

The size boards you will end up with depends on a) the size boards your lumberyard carries; and b) the clarity (quality) of the lumber you buy. Many lumberyards carry shorter-length, odd-size boards you can pick and choose from.

A Discussion of Hardwood Grades

Hardwood lumber is mostly graded on the size and number of pieces that can be obtained from a board when it is cut up and used in the manufacture of a hardwood product. Grade is determined from the poorest face or side of the lumber. Buyers usually intend to use only the clear (defect free) material in a board, so a higher grade has a larger percentage of clear wood. But as you will see below, going for the higher-grade boards may actually work against producing a truly beautiful product.

The grades of hardwood lumber, as defined by the National Hardwood Lumber Association (NHLA), in order of quality are as follows:

- Firsts
- Seconds
- Selects
- No. 1 Common
- No. 2A / 2B Common
- Sound Wormy
- No. 3A Common
- No. 3B Common

However most lumber mills and yards use adaptations and combinations of the NHLA grades. For example, Firsts and Seconds are often combined into one grade: "FAS"; No. 1 Common and Selects are often identified as "No. 1 Common and Better"; and No. 2A Common and 2B Common may simply be referred to as "No. 2 Common". For instrument building, we are not interested in anything less than No. 1 Common.

Grade	Grade A:	Grade A:	Grade B:	Grade C:
National Hardwood Lumber Association Grade	FAS / F1F	Select & Better	#1 Common	#2 Common
Clarity	83-1/3% or more	83-1/3% or more	66-2/3% or more	50% or more
Width	5-1/2" plus	3-1/2" plus	3" plus	3" plus
Length	8' plus	6' plus	4' plus	4' plus

Boards are graded on the amount of clear wood (clarity) they contain. However you will discover that some of the more beautiful, even exotic, features of wood are found in the lower grades. Less "clear" wood often has interesting character that can be incorporated into the design of the end product. As a result beautiful bargains are often found in the less expensive grades of lumber. If you're smart, you will examine the No. 1 grade to discover real prizes.

Helpful Definitions

CF – Clear Face

FAS (First and Seconds)

The best and most expensive grade. Kiln dried. When clear, wide boards are required.

F1F / FAS1F

F1F/FAS1F stands for "First and Seconds one Face". The better face must meet the requirements for FAS, and the other face must be graded at No.1. Except for minimum width and length, FAS1F and Selects are virtually the same grade.

S2S (Surfaced Two Sides)

With S2S wood there is no need to surface the lumber yourself. Because it is finished on both sides, you get a good idea of the grain patterns. You will pay more for S2S hardwood .

SLR (Straight-line Ripped)

One edge of the board is ripped (cut) straight while the other edge is left uneven (rough cut).