



Reinforcing Seminar Furniture

We at Woodware Designs often help produce seminars for [Landmark Education Corporation](#) . Landmark has a nice set of portable furniture for use in these seminars, but this furniture has to be continually hauled between hotel meeting rooms. All this moving about is hard on it. This note is on ways to reinforce portable furniture to make it much stronger and easier to transport.

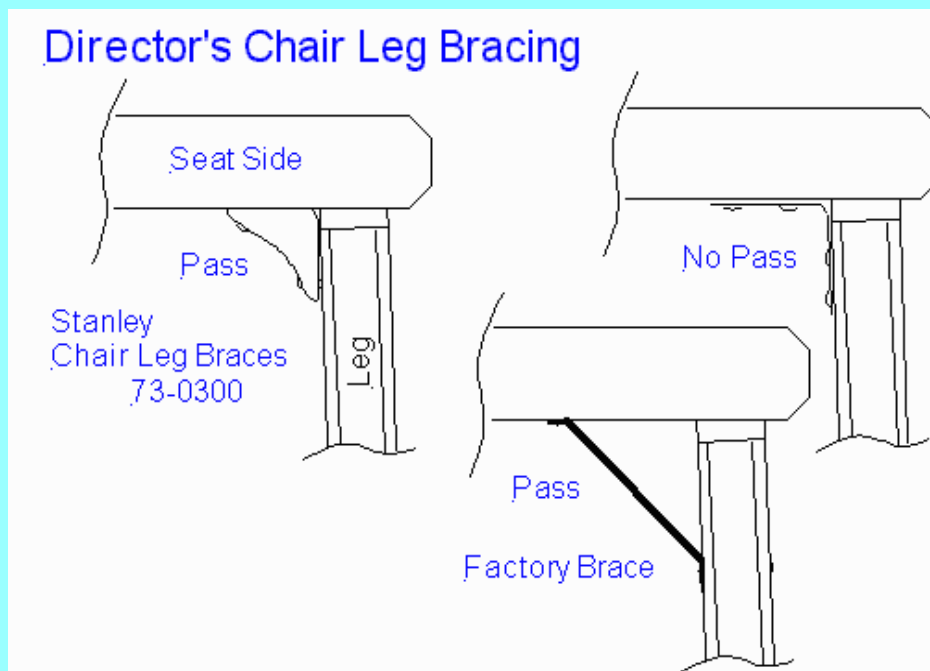
If you would like to know more about our positive experiences with Landmark, please [drop us an e-mail](#). Also check our our [Baltimore Landmark Community Calender](#) for upcoming events.

The pieces of furniture discussed below are:

1. [Directors Chairs](#)
2. [Folding Tables](#)
3. [Blackboards](#)

(Beyond Woodworking)

4. [Stacking Chairs](#)
5. [Batteries for the wireless mike](#)
6. [Mike Cables](#)



1. Directors Chairs

Tall directors chairs need diagonal bracing for their legs. Without bracing the legs can loosen and break. Adding a few wood screws can also strengthen the arms and back. If the footrest or feet are broken these are also easily repaired.

1. Technical Information

A specific type of hardware is available for this task: Stanley 1-inch Chair Leg Braces (see the sketch above). These are available at hardware stores for about \$2.20 for a set of four. No other type of hardware works as well, so accept no substitutes.

Some chairs already have diagonal braces as in the middle figure above, and require no additional hardware. The small gap caused by the angle of the chair leg does not affect the strength of the brace.

The materials required are:

1. Chair braces
2. 1 inch #6 flat head wood screws -- up to 12 per chair
3. Wood glue
4. Wood dowels -- as required
5. Replacement Feet -- as required
6. Sand paper

The braces and feet can come from the local hardware store.

The tools required are:

1. awl
2. electric drill
3. drill bit for pilot hole for #8 screw
4. Screwmate Drill bit for #6 1-inch
5. Phillips screwdriver

The drill is for guide holes for the #8 screws that mount the braces. Gloves also help.

2. **Recommended Action:**

First take an inventory to see how many braces and other parts, such as feet or replacement backs and seats, are needed. Also check the pegs that support one end of the foot rest, as these often need attention. If the joints are loose, you will need wood screws to strengthen them. Make a list of the needed materials.

1. **Loose Joints**

If a leg joint is loose, pull it apart, clean the peg with sand paper, and apply wood glue. Push the peg hard back into the hole. Drill a screwmate hole from the inside of the leg frame into the peg.

2. **Chair Braces**

Turn the chair upside down and remove the seat and back. Hold the chair brace in place, centered on the leg, and hard against it. Mark the screw hole centers with the awl. Drill the guide holes. Install the screws. The installation of the braces takes about 15 minutes per chair.

3. **Feet**

Check to see if feet are missing. Some factory feet went into a 3/8 hole in the leg. These holes must be filled with dowel before replacement feet can be installed.

4. **Foot Rest**

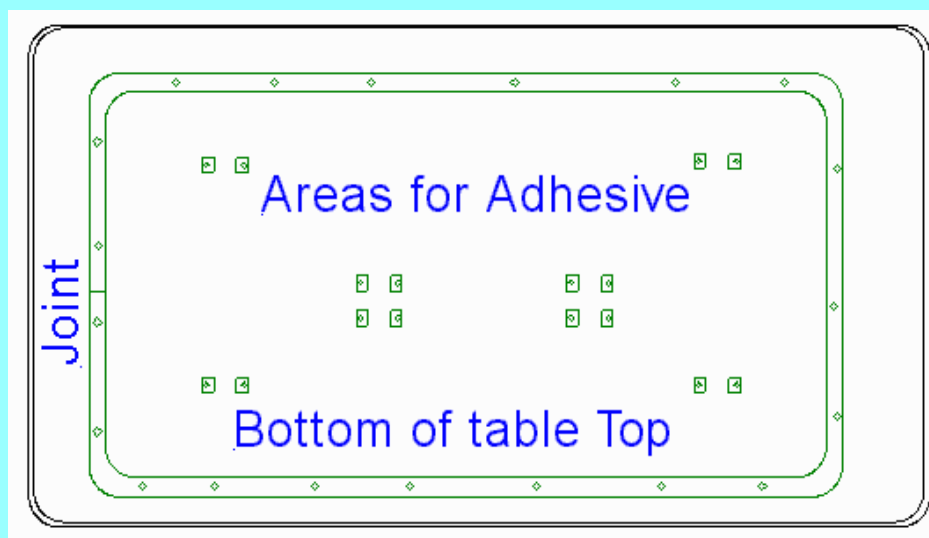
If the peg that supports the footrest is damaged, replace it with as heavy a piece of dowel as you can fit (1/2 inch or larger) and reinforce this with a screw. These

dowels should be maple (very light in color) and not the weaker tropical hardwood (more tan in color).

5. **Seat and Back**

Washing the cloth seat and backs in warm water helps restore their appearance and ironing makes them look even nicer.

Now vacuum up any wood dust and the repair work is complete. The chairs can be used immediately. If there are a lot of chairs to repair, the people who assist tackle the task by setting up a work party.



3. **Folding Tables**

People inevitably will sit on the folding tables. Their tops are made from a material that does not hold its screws very well. Fortunately these tables can be strengthened easily and simply by gluing the metal frame to the top with general purpose construction adhesive.

1. **Technical Information**

The table tops are made from Medium Density Particle board, which is inexpensive, reasonably strong, and stable but does not provide a good grip on screw threads. Sheet metal screws are used to attach the metal frames to the tops, and the metal frames provide much of the table's strength. Over time, the screws can strip out of the top. This lets gaps form between the tops and frames, thus greatly weakening the table.

This problem is easily addressed by gluing the frames to the tops with general

purpose construction adhesive. This material comes in tubes for a hand caulk gun and costs about \$2.00 a tube. It is normally used for jobs like mounting slats on cinder block walls. It is available at any home fix-up store, one tube will reinforce about three tables.

If the metal frames have an unwelded joint, these can also be reinforced with a small mending plate and two bolts.

The materials required are:

1. General Purpose Construction Adhesive -- 1/3 10 oz. tube per table
2. #8 -- 5/8 inch pan head screws -- as required
3. toothpicks
4. Wood glue
5. 2 in. Mending Plate -- As required
6. #10 x 1/2 in. Round Head Bolt with nut -- 2 per plate
7. Soft Scrub Cleanser
8. 1 inch plastic feet -- as required

The tools required are:

1. Hand caulk gun
 2. Standard screwdriver
 3. Phillips screwdriver
 4. Gloves
 5. Power Drill
 6. Small Bits
 7. Pencils
 8. Marker
 9. Cleaning sponge
 10. Plastic bucket
- The following tools are most helpful
11. Long Phillips driver bit for drill
 12. Whisk Broom
 13. Paper towels
 14. Plastic cup

2. Recommended Action

Inspect your tables, count them, and determine if any are missing screws or feet. Purchase one tube of adhesive for three tables and some extra screws. You may also need some wood glue and toothpicks for stripped holes. Inspect the joints in

the metal frame and buy a mending plate and two bolts for each unwelded joint. Look at the legs and count missing plastic feet.

Allow 30 minutes per table for each two person team.

Place one table in the middle of a room and turn another up-side-down on top of it. Take a pencil and draw lines around all the metal frame parts (see sketch above). Make a small mark beside each screw. Inspect the screws to see if any are missing or stripped out of the top. Also look for screw holes in the metal that have never had screws in them and drill a pilot hole.

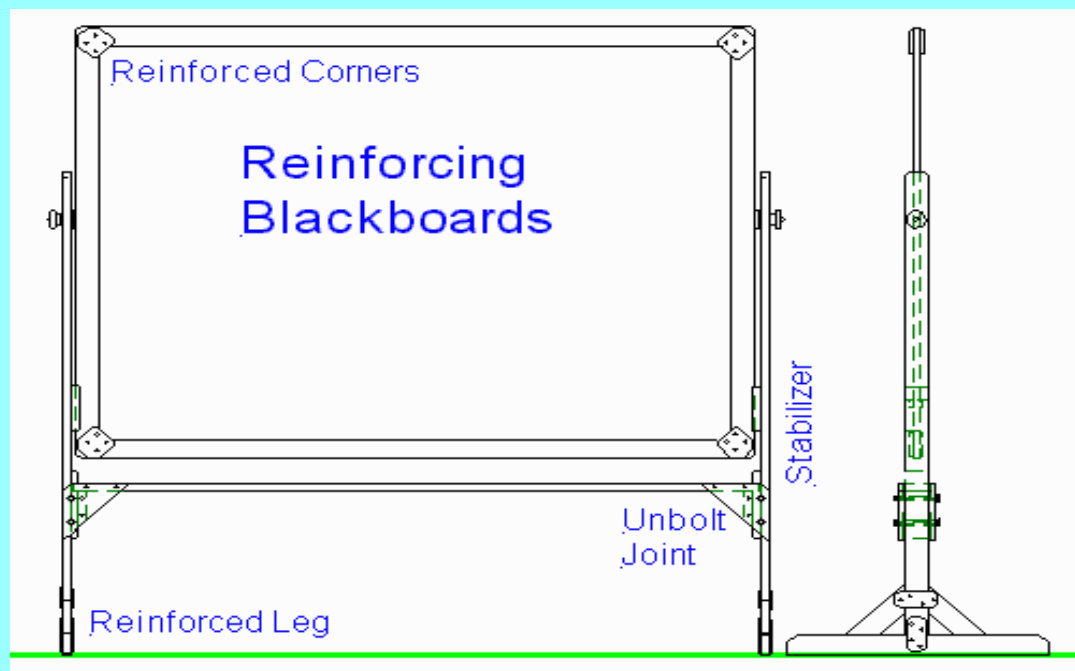
Remove all the screws from the metal frame and legs and place them in a plastic cup. Brush away any sawdust. Stick wood glue and tooth picks into any stripped screw holes. Lay down a 1/4 inch bead of adhesive between the pencil lines. Place the metal frame back in place and reinstall the screws. Do not over-tighten the screws. You will know you used the right amount of adhesive if a small amount comes out from under the metal frame most of the way around. Be very careful in placing the frame so that you do not get adhesive on the sides.

If the metal frame joint is not welded at the joint, center a 2 inch mending plate over the joint and drill two screw holes. The plate should be inside the frame and away from the the table top. Tighten the nuts well and place a small amount of adhesive on the nuts to stake them. The bolts look best if you spray paint them dark brown before installation.

You can repeat these steps with the brackets that hold on the legs. Be careful to put the adhesive only on the area around the screws. You do not want very much of it to get on the moving parts.

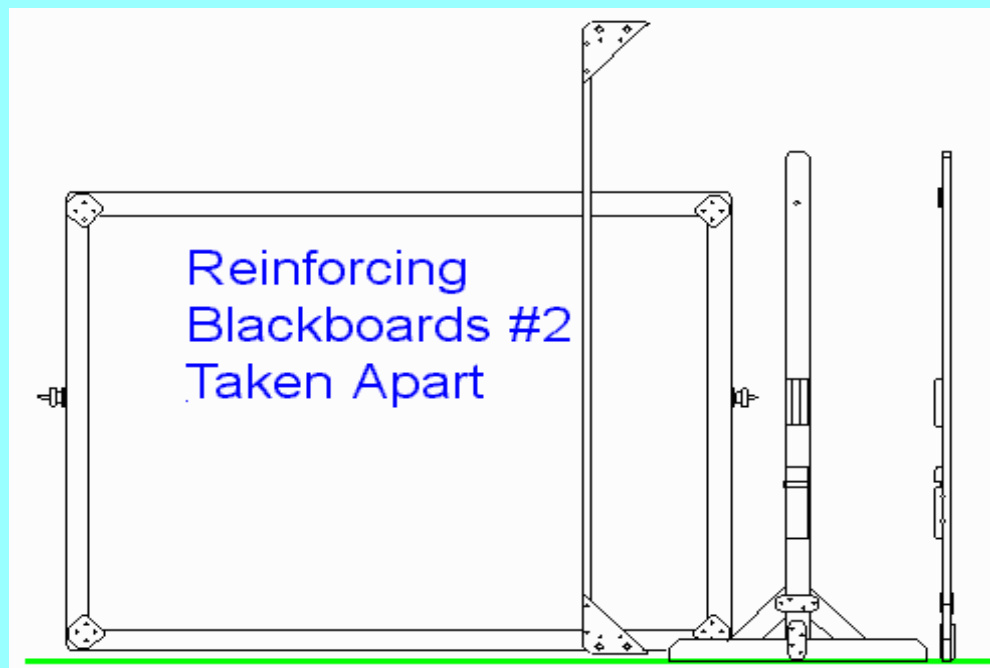
Mark the bottom of the table 'Glued'. Scrub the edge of the table with the cleanser to remove white paint marks.

This glue takes about 24 hours to reach to full strength. The table will then hold up much better to hauling and one person sitting on it is very unlikely to break it. Of course, you still cannot jump up on top of it and jump up and down on it in excitement.



4. Blackboards

The blackboards we normally use are double sided and mounted in an oak frame. The frame can be damaged in hauling. The board would be much easier to haul if they could fit in a mini-van or station wagon. The actions below both reinforce the blackboard and convert the frames so that they can be taken apart for transport.



1. Technical Information:

You want the blackboards to look good but not so good as to distract from the

speaker. You can do this with the following actions:

1. Clean board surface
2. Reinforce the corners of the blackboard
3. Reinforce the legs
4. Stabilizer the board
5. Modify the frame for easier transport

The materials required for **two** blackboards are:

1. Oak slats, 2 in. wide 1/4 inch thick -- 64 inches
2. Oak slats, 3 in. wide 1/4 inch thick -- 48 inches
3. Oak slats, 4 in. wide 1/4 inch thick -- 26 inches
4. Oak, 2.25 wide 3/4 inch thick -- 8 feet
5. Hardwood plywood, 1/4 inch thick -- 2 sq feet
6. 1 inch #8 flat head wood screws -- box of 100
7. Wood glue
8. 5/16 inch Wood dowel -- to fill holes
9. 3/16 inch by 4 inch, bolt -- 8
10. 3/16 inch flat washer -- 18
11. 3/16 inch wing nut -- 8
12. 3/8 inch wing nut -- as required
13. Wood filler
14. Sandpaper
15. Natural oak stain -- 1 pint
16. Polyurethane varnish -- 1 quart

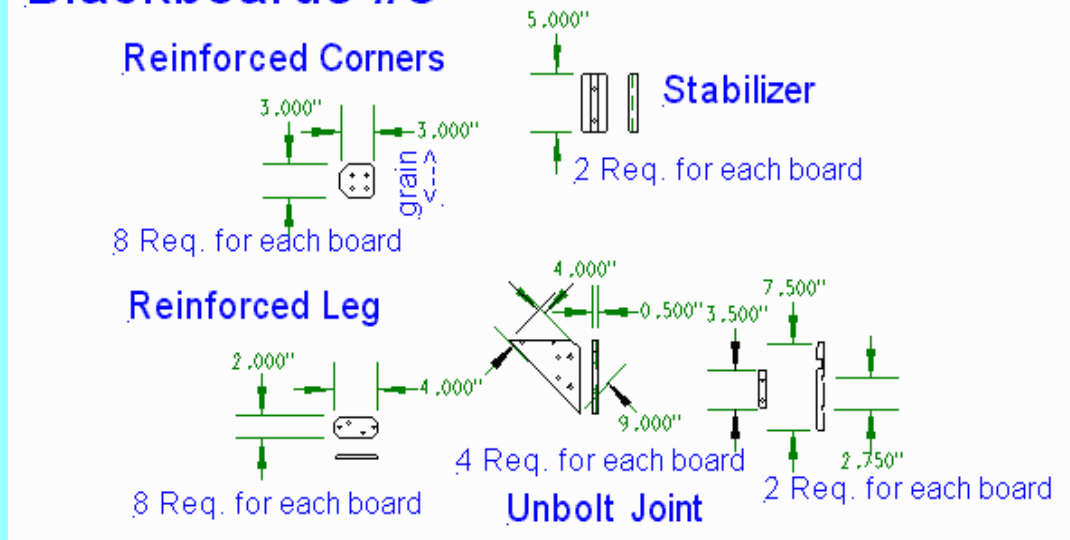
These materials cost about \$40.00 new for two blackboards. Some of the parts can be made from scrap wood; wood flooring scrap worked well. Home Depot sells the thin oak slats we used.

The tools required are:

1. Saw -- table, radial arm, or miter box and handsaw
2. Electric drill
3. Screwmate drill bit for #8 1 inch
4. 1/2 inch drill bit
5. Screwdriver
6. Wood chisel

This work is best done in a home workshop. If necessary, it can be done using a handsaw and miter box anywhere.

Reinforcing Blackboards #3



5. Recommended Action:

The following actions:

1. Blackboards

First clean the blackboard with a mild household cleaner to remove all the dust. Inspect the surface to determine if new paint is needed. You can purchase special paint for blackboard surfaces if it is needed. You will probably have to redraw the guide lines on the surface with a permanent marker after cleaning.

Reinforce the four corners with pieces of thin hardwood on both sides as shown above. They are cut to suggest the tabs that hold pictures in an old time picture album. Screw and glue them on with the grain running diagonally across the joint. Sand all edges and corners to remove any sharpness. Install the two pieces on each corner of the blackboard with wood screws and glue. Fill the screw holes and sand smooth.

Inspect the metal fittings that support the board. You may need to file the notches new and sharp, deepen the screw countersinks, and replace missing screws, damaged bolts, washers, and wing nuts.

2. Legs

The wooden legs take major beating in transport. The sketches above show the areas to reinforce with wooden plates. If the pieces of the feet are of uneven

thickness, you may need to remove some material from the back of the plate with the saw and chisel. Sand all edges smooth and install with wood screws and glue. Place plates on both sides of the leg.

3. **Board Stabilizers**

Two wooden stabilizers for the board are also shown to replace the unsightly taped erasers often placed on the board frames. These are made from simple pieces of scrap hardwood and are screwed to the frames without glue. The edge of the board fits into the groove in the stabilizer. You may need to custom fit the depth of the groove.

4. **Joints**

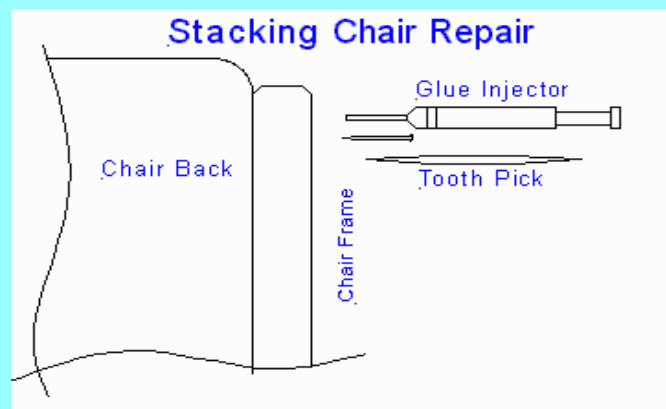
The frame crosspiece comes held to the uprights with two lag bolts. These break easily and cannot be taken out and put back vary many times. The sketch above shows these joints converted so that they are held with two bolts and wing nuts.

Double up the the frame uprights with a piece of wood with a notch for the cross piece and two bolt holes. Saw off the crosspiece and add the two end fittings. These are made from a piece of the thin oak material glued to thin plywood. This was done because the oak has a tendency to warp and the plywood does not match the rest of the wood.

If you are very careful in measuring and drilling the bolt holes, you will be able to place any crosspiece with any frame member. This is best done by making a pattern out of heavy poster board or sheet metal.

Always place a flat washer between wood and a bolt or nut. For transport, the bolts can be placed in the holes in the cross piece. Be sure to buy a few extra bolts, washers, and wing nuts.

Beyond Woodworking



6. Repairing Stacking Chairs

We use a lot of simple metal and cloth stacking chairs. If in poor repair, these chairs are uncomfortable, distracting to the user, and unsafe. The most common failures are:

1. Stripped screws in the backs
2. Broken frames
3. Dirty seats

Go through all the chairs and tighten all the screws. Sort out the chairs with problems.

1. Stripped Screws in the Backs

The backs are held on by four long sheet metal screws that screw through the cloth into the edge of the hidden back material. This material is either plywood or medium density particle board and neither holds screws very well.

If the screws are just stripped and the back material is not broken, you can often repair it with glue and a toothpick. You to inject wood glue down the stripped hole. This can be done with a glue bottle with a thin round point or a special tool. These tools are sold through woodworking catalogs and are sometimes available at large home repair stores. White or tan wood glue works just fine.

If a screw is stripped or missing, loosen the other screws in the back. Pull the back away from the frame and inject the stripped screw hole with a modest amount of glue. Stick a toothpick in the hole and brake it off at the surface. Then replace all the screws but to not over-tighten them.

2. Broken frames

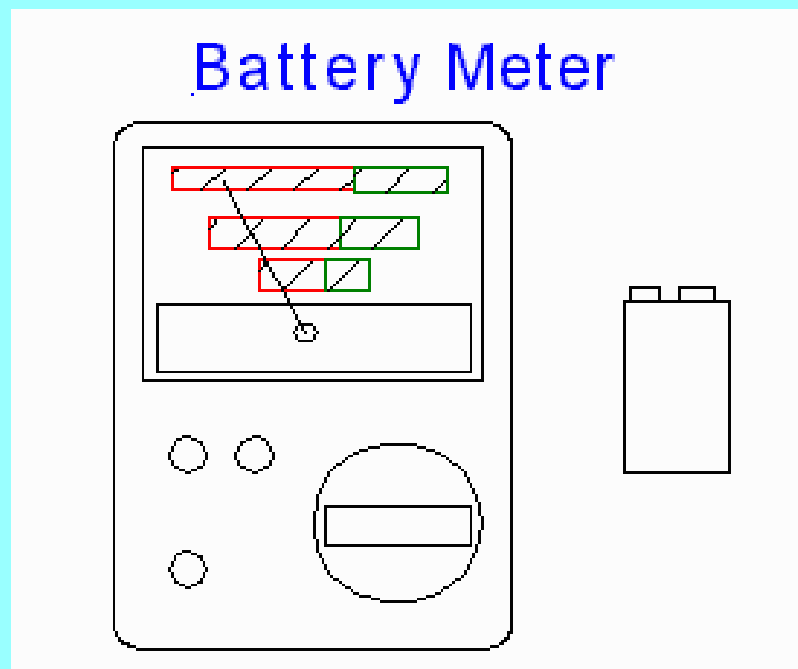
Broken frames have to be welded or brazed back together. This requires someone

with some metal working tools and skill. A simple brazing set will do the job well enough and these start at about \$60.00. This less than the cost of one new chair.

Start by removing the seats and back. Then strip the paint from the area with a wire brush in an electric drill. File or grind away as much of the old weld as practical. Weld or braze the broken joints. Wire brush the area clean and spray paint.

3. **Cleaning the Seats**

Vacuuming will remove a lot of dust from the seats and freshen them up. Stains can be attacked with a steam upholstery cleaner. These devices can be rented but are becoming more common as a household appliance.

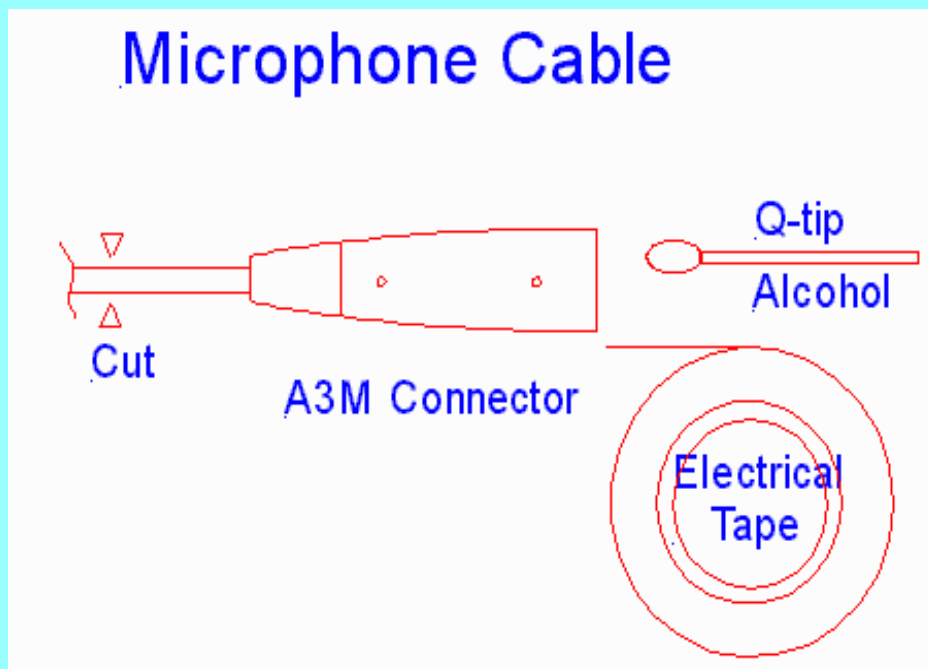


7. **Battery testing**

Our wireless mikes use 9 volt batteries. We try to start each session with a fresh battery and save the old one if it is not be quite used up. This results in our carrying around a large number of questionable batteries and an occasional cut-out of the wireless mike.

This situation is greatly helped by using an inexpensive battery tester from Radio Shake and discarding the weak batteries. The Micronta 22-032A battery tester is light weight and rugged. It is often offered on sale at about \$10.00.

By the way, there is a wonderful, hour and a half training film on the proper use of the wireless mike. You can rent it at most Video stores. It is called *Singing in the Rain*.



2. Repairing Microphone Cables

Microphone cable often break causing loss of sound or hum. Often the condition will come-and-go when you wiggle the wire behind the connector. Swapping to a different cable may also clear the problem and point out the bad cable. A person with experience soldering can repair these cables at less cost than replacing them. A person with no soldering experience can often do some good by cleaning the cables.

The most common cable failures are:

1. Broken or frayed wires inside the connector.
2. Worn or bent connector contacts.
3. Broken wires in the cable just behind the connector.
4. Broken wires at mechanically damaged points on the cable

1. Types of Cables

There are two types of cables:

1. Shielded
2. Unshielded

And two types of connectors:

1. A3 Microphone & Audio Connector (three conductor)
2. 1/4 inch plug (tip, ring, and sleeve)

The shielded cables have a braid of fine wire just under the outer cover and are intended for use from the microphone to the amplifier. The unshielded cables have only three wires

and are intended for use from the amplifier to the speakers. Unshielded cables may pickup hum if used from the microphone to the amplifier.

The three wire A3 connectors are far superior to the 1/4 inch plugs. If you have a mixed system it is much better to replace all connectors with the A3 type. Adapters from one type connector to the other are a major source of problems.

2. **Cleaning**

A person without electronic experience can to a good job of cleaning the cables and connectors. The best cleaning solution is a strong alcohol. Radio Shack sometimes has this as non-residue electronic cleaner but it is very expensive in small spray cans. Professional electronics technicians use 200 proof ethanol but this is hard to obtain. Two products you can obtain are Denatured Alcohol from the home supply store (shellac thinner) and grain alcohol (Everclear) from a liquor store. Russian technicians invariable use Vodka but then they know a lot about Vodka.

Use these products in a well ventilated area and we advise the use of rubber gloves. The alcohol is quite flammable and must be kept away from open flames. Do no smoke and do not use around powered electronic equipment.

Remove all old tape and wipe down the cables with alcohol and paper towels. Rub hard to remove old tape residue. Inspect for mechanical damage to the cables.

Wipe down the outside of the connectors with the alcohol and paper towels. Use 'Q' tips inside the connectors. Cut the cotton head off some 'Q' tips and use the paper shaft with alcohol inside the female connectors.

3. **Replacing Connectors**

Replacing the connectors should be done by a person with soldering experience. If you think that it is worthwhile for me to add a several pages here detailing soldering technique please [email](#) me.

The A3 connectors are available from Radio Shack as 274-011 'A3F Microphone & Audio Connector' (female, \$4.40) and 274-010 'A3M Microphone & Audio Connector' (male, \$4.20). These connectors are commonly available at all electronics parts stores.

Cut off the old connector and about six inches of cable as the wires sometimes break just where they come out of the connector. Take one connector apart to get the wire color scheme you should use for the new connectors. Save all the screws and metal parts.

There are three pins and a connection to the outer shell. I always connect the #1 pin (ground) to the outer shell pin. Some commercially made cables do not have this connection. I am sure this practice reduces hum. This may require you to add a short piece of wire.

Use the old connectors to get the color scheme for the replacements as the color of the cable wires varies. Use small strips of electrical tape or shrink tubing on the signal joints for insulation.

4. Taping the Connectors

Wrapping the outside of the connectors with electrical tape helps reduce mechanical damage, makes the connectors less eye-catching, and shows which cables you have rebuilt. Use good electrical tape as is lays much better than the cheap stuff; 3M makes all the best tapes.

There is a trick to getting the tape to lay flat on odd shapes like the connector body. You control the angle the tape is laying on by intentionally stretching only one side of the tape. Lay down an inch or so of tape, look to see if it is going the way you want and then stretch one side only until it is pointing just right. It takes some practice to learn to do this without wrinkling the tape.

You can also obtain a role of colored table from Radio Shack or the home supply store to use to make the shielded cables. Simple lay down a band of color a few inches down the cable from the connector. This will tell you which cables to use for the microphones.



3. Closing

Thanks for visiting Woodware Designs. Be sure to check out our many plans for low-stress computer furniture before you leave. Please drop us [an email](#) on ideas you have for supporting seminar production.

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