How to install backchecks

Note: All pictures can be enlarged for better clarification.

Revision 7 – 8/2009

Backchecks wear out in a piano much like brake pads in an automobile. While wear is a valid reason to change backchecks, the location of the backcheck (in relation to the hammer tail) is even more important.

Even if the original backcheck installation was done well by the manufacturer, the act of replacing the hammers changes everything. If you replace hammers, include the backchecks for a first class job. Accurate and consistent checking is quite important to the playability of a piano.

The following procedure when used with the tools and backchecks supplied by WNG will place the backcheck in the proper location so that good checking will be easy to achieve during the regulation process.

Required Tools

Shop Tools

- Vertical disk or belt sander
- Drill Press

Hand Tools

- Side cutting wire cutters
- ½" (13mm) wooden dowel 8" (203mm) long
- #30 drill bit jobbers length, WNG Part #
- #31 parabolic flute drill bit, WNG Part # 06-5606
- Calipers
- 1 - Right angle die grinder, Available from WNG, part # 06-0265
- 1 - quick-change disc holder for 2" (50mm) disc, WNG part # 06-0266
- Orbital Sander
- Pencil
- Center Punch
- 6" (150mm) rule
- Several small c-clamps
- Hammer Shank clamp

Supplies

WNG Glue, WNG Part # 06-5617
6" (150mm) piece of piano wire – For applying glue
1/8" (3mm) x 3' (I meter) hardwood dowel
Quick change sanding disks - 80 grit, WNG part # 06-0267
Quick change sanding disks - 120 grit, WNG part # 06-0268
120 grit sandpaper for Random Orbital Sander
½" – 1" Masking tape

Back Check Jig Set (Available thru WNG, part # 06-5619)

WNG hammer tail arcing jig
WNG Backcheck Angle Block
WNG Backcheck Inserter
WNG Backcheck Line Marking Jig
WNG Backcheck Height Jig

WNG Dip Block, Part # 06-5620
WNG Level Stick, Part # 06-5608

Procedure

1. Remove the old back checks.
    a. Use a piece of dowel (1/2"- 13mm) and a pair of side cutting wire cutters.
    b. Place the dowel just back of the old backcheck wire.
    c. Place the wire cutters on top of the dowel.
    d. Rotate the handle of the cutters up.
    e. Grip the backcheck wire.
    f. Rotate the handle of the cutters down raising the backcheck wire in the hole.
        i. Repeat until the wire is removed from the hole.
        ii. Repeat the process until all backchecks are removed from the keys.

g. Check the backcheck blocks to make sure that the removal process has not loosened the backcheck blocks.

    i. Re-glue as needed to correct.

2. Plug the old back check holes.

    a. Block up the back of all 88 keys to slightly above their down position on the keyframe.

    b. Use 1/8" (3mm) hardwood dowel.

    c. Drill out the old backcheck holes.

        i. Use a #30 drill bit (.128") or (3mm).

            1. This bit will be slightly larger than the dowel and the old hole.

            2. Test the dowel in the hole drilled by this bit.

                a. All dowels are not the advertized size.

                b. If necessary measure the dowel with calipers. A ruler is not sufficient.

                c. Select a drill bit approximately .004" (.01mm) larger than the measured size of the dowel.

    d. Set up bit to drill 1/8" (3mm) from bottom of key.

        i. Use tape with a flap so you can see when the correct depth is reached.

    e. Drill out all 88 keys using a hand drill.

    f. Blow out the holes with compressed air.

    g. Cut the 1/8" (3mm) dowel into 6" (150mm) lengths.

    h. Swab the holes with WNG glue.

        i. Use a piece of piano wire to get the glue down into the hole.

i. Push the dowel into the hole and rotate to distribute the glue around the dowel.

j. Trim of the excess dowel, with wire cutters, about 1/8" (3mm) above the top of the backcheck block.

k. Allow the glue to fully dry.

    i. If you need to proceed before this is done, you must clean the glue squeeze off the backcheck blocks with a paper towel or cloth.

l. Sand the dowels flush to the back check blocks.

    i. Using a right angle die grinder equipped with an 80 grit-sanding disk. (See Fig. 1)

Fig. 1

Right angle die grinder

m. Use a random orbital sander (with 100 –120 grit sand paper) to sand the 80 grit scratches from the back check blocks for a nice looking job.

3. Custom Bore hammers if possible.

    a. WNG recommends that you custom bore hammers to account for the variations in string height common to most pianos.

        i. The best rebuilders for a number of reasons practice custom boring of hammers.

ii. In the case of back checks, it places the point of checking in the same place across the piano, and makes installation of new back checks easier.

iii. The procedure and parts will work without custom boring, however more effort will be required to achieve proper height.

4. Setup the WNG Hammer Tailing Jig in a vertical disc or belt sander.

   a. Set up WNG hammer tail jig with the right shank size. (See Fig. 2)

      i. WNG shanks use 3.94mm shanks and 4.67mm shanks.

      ii. Place the 4.67mm pin in the jig.

         1. Tighten screw until snug.

   b. Set up sander.

      i. Sander should be equipped with 80 grit sand paper.

   c. Remove the Adjusting Panel from the jig.

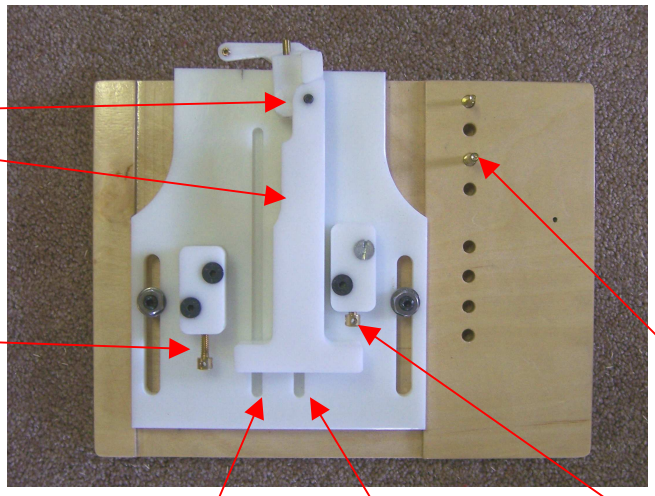


Fig. 2

WNG hammer tail arcing jig

Fig. 3

WNG hammer tail jig table base locator

d. Locate the WNG Hammer Tail Jig Table Base in and out in the sander with respect to the sandpaper. (See Fig. 4)

    i. Place jig so that the key in the bottom of the jig is in the miter slot on the table. (See Fig. 3)

    ii. If there is no slot or the slot is too small you will need to remove the key on the bottom of the jig.

        1. The key on the jig is not absolutely required for the jig to function.

        2. Once the key is removed you will need to position the jig manually so that the base is parallel to the sandpaper and the front edge is about 1" (25.4mm) from the sand paper.

        3. Clamp loosely until the jig is positioned side to side.

Fig. 4

WNG hammer tail arching jig mounted to sander

Keep 5/32" (4mm) clearance between jig and sand paper

e. Install and locate the Adjusting Panel in the jig. (See Fig. 4)

   i. Position the Adjusting Panel so that it is about 5/32" (4mm) from the sand paper.

   ii. Clamp to Table Base with the supplied clamping nuts.

   iii. Locate the WNG Hammer Tail Jig side to side in the sander with respect to the edge of the sandpaper. (See Fig. 5)

   iv. Move the jig left or right until the edge of the sand paper is lined up with the line on the jig. (See Fig. 5)

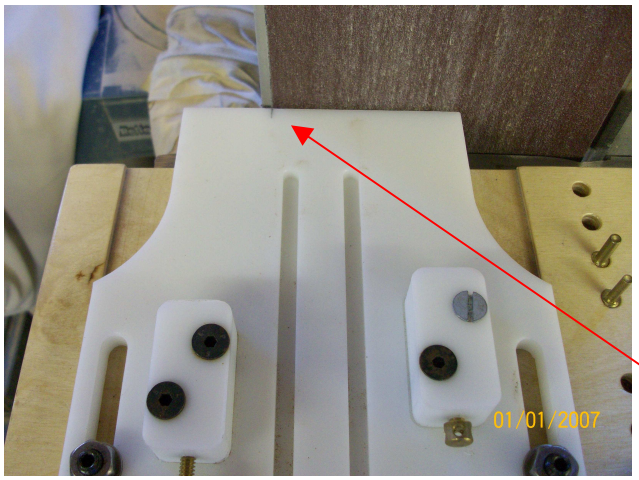


Fig. 5

Swivel position for set up

Line up Arching jig line with edge of the sand paper

f. Clamp the jig firmly into place so it will not move during operation.

   i. Use small c-clamps

   ii. Make sure that the relationships set up in the first step are maintained. (See fig. 4 and 5)

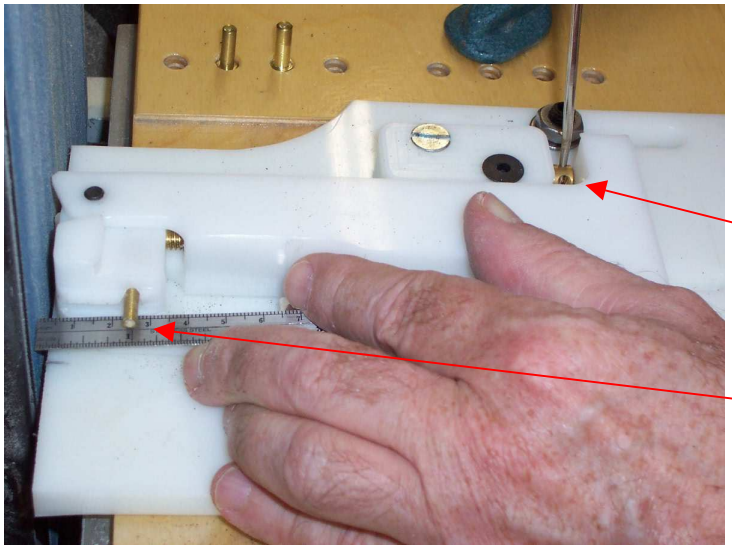


Fig. 6

Tail cut off adjustment screw

Center of pin - 1" (25.4mm) from sand paper

5. Cut the hammer tails to the correct length. (See Fig. 6 & 7)

a. Calibrate the jig to yield the correct measurement for the tail length. (Set-up)

   i. The proper length for the hammer tail is 1" (25.4mm) from the center of the hole to the end of the tail down the centerline of the hammer.

   ii. With a stick ruler against the sander wheel, adjust the captain stop screw so the hammer pin center is 1" (25.4mm). (See Fig. 6)

   iii. Lift the slide and swivel from the base and place a scrap hammer (a spare hammer from the set perhaps) on the swivel.

   iv. Rotate the swivel around so that the hammer tail is pointing towards the sandpaper.

   v. Place the swivel into the base and slide the hammer tail into the sandpaper until it stops cutting.

   vi. Measure the tail length.

   vii. Adjust the capstan stop in the jig until the 1" (25.4mm) dimension is achieved.

Fig. 7

Cutting hammer tails to length

b. Cut the hammer tails.

i. Lift the slide and swivel from the base and place a hammer on the swivel.

ii. Rotate the swivel around so that the hammer tail is pointing towards the sandpaper.

iii. Place the swivel into the base and slide the hammer tail into the sandpaper until it stops cutting.

iv. Double check measurement.

v. Cut the hammer tails for the first size shank.

vi. Change the pin to the other size required for WNG shanks.

vii. Cut the rest of the hammer tails to the proper length.

Fig. 8

Arcing hammer tails

6. Arc hammer tails. (See Fig. 8)

a. Calibrate the jig to produce the correct seat for checking.

i. A proper seat for checking is no longer than 3/8" (9.5mm) surface and as far out (away from the shank center pin) as possible.

ii. Make sure that the correct diameter pin is in the swivel.

1. A loose fit on the pin will cause the arc to be incorrect.

iii. Lift the slide and swivel from the base and place a scrap hammer (a spare hammer from the set perhaps) on the swivel.

iv. Rotate the swivel around so that the hammer tail is parallel to the sandpaper.

v. Place the swivel into the left base slot and slide the hammer tail towards the sandpaper until it stops.

vi. Rotate the hammer on the swivel to arc the tail. (See Fig. 8)

vii. Inspect the checking surface and adjust the stops as necessary to achieve the proper seat for checking on the hammer tail.

b. Cut the checking seat on the hammer tails.

i. Rotate the swivel around so that the hammer tail is pointing to the sandpaper.

ii. Place the swivel into the base and slide the hammer tail towards the sandpaper until it stops.

iii. Rotate the hammer on the swivel to arc the tail.

iv. Cut the arcs on all hammers with the first size hole. (Shank size)

v. Change pins and cut the rest of the hammers.

7. Undercut tails and other molding work on hammers.

a. This is not really part of the backcheck job.

b. Some rebuilders undercut the tails in the top two treble sections for better sustain. If you intend to do this now is the time in the process.

8. Taper hammers.

    a. While it is not part of the backcheck job at this point it would be good to taper the hammers.

    b. A full top to bottom taper for hammers is a good practice.

        i. If you do not have the equipment to do this at least taper the hammers from the shank down or you will likely have clearance and weight problems.

    c. Hammers check better if the tail is tapered down to about 7/32" (5.5mm) width at the checking end.

9. Glue hammers on shanks.

    a. This is not really part of the back check job but the next steps of the backcheck job require the hammers on the shanks. Refer to the manual "How to Install Shanks and Hammers".

10. Break the edge on the hammer tails.

    a. The edge on the hammer tail after arcing is quite sharp and can cut the back check buckskin if the installation is not absolutely perfect.

    b. Clamp the hammer shanks together a section at a time.

    c. Use a sanding block with 100 grit paper

    d. Position the block at about a 45° angle to the hammer tail.

    e. Sand with a curved motion to put, approximately, a 1/32" (.8mm) radius on the edge of the hammer tail.

    f. This will keep the backcheck from cutting the backcheck buckskin in the event the installation is not perfect.

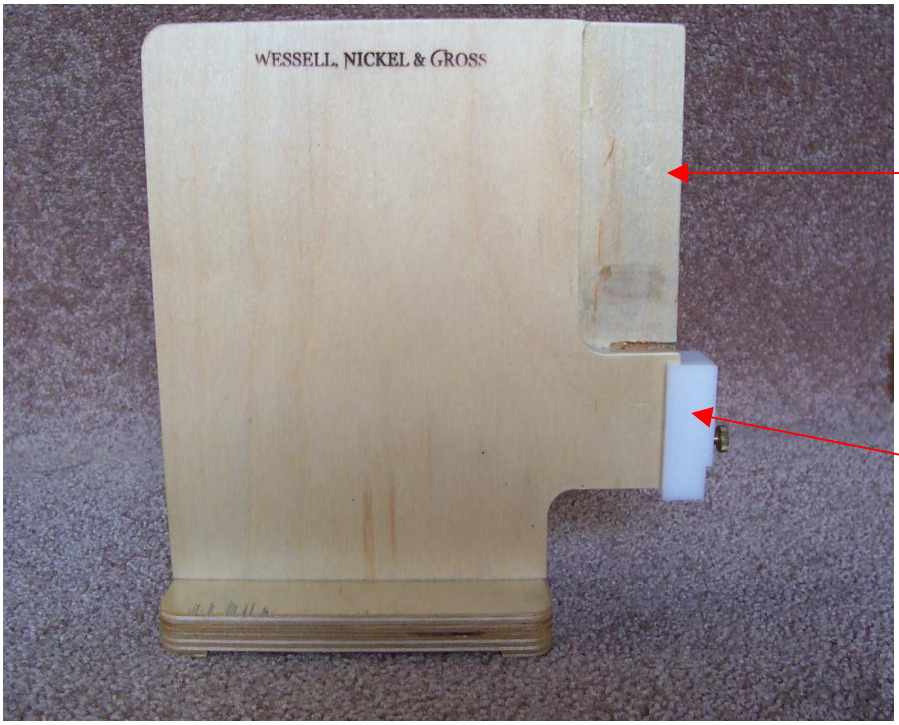


Fig. 9

WNG back check line marking Jig

Backcheck marking slide

11. Mark the backcheck line.

    g. WNG uses the strike line as defined by the hammers to locate the backcheck front to back on the key.

        i. The process uses a centerline on the hammer to locate the strike line.

    h. The keyframe must be felted and the keys at the correct key height for this process to work properly.

        i. If the keyframe is not yet felted, make blocks that will sit on the slats of the keyframe that will hold the keys to the correct height front and back during the backcheck line-marking process. (See Fig. 10)

Fig. 10

Block to support keys

Fig. 11

Marking centerline on hammers 1, 72 and 88

i. Hammers you will use as trials in the hammer gluing process must have a centerline from the top to the bottom of the hammer.

   i. If you use a 1, 72 and 88 system, then these are the only notes that need the line on them.

   ii. If you use the "ends of sections" from an old set of hammers, then you will need to mark a centerline on the hammers at the end of each section.

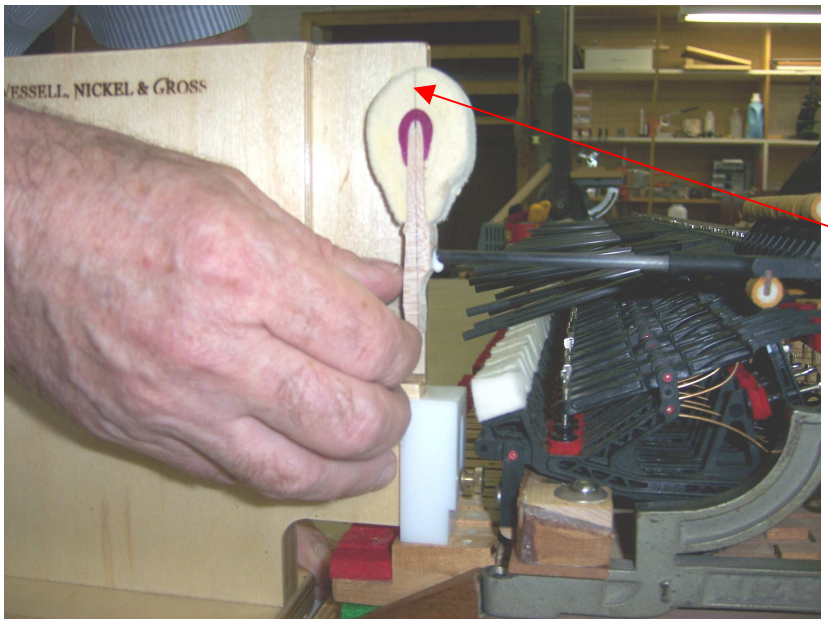


Fig. 12

Setting up jig for locating backcheck line

j. Use the "Backcheck Line marking jig" to locate the backcheck line on the backcheck block.

   i. Note: This system works well on any piano that has a reasonably normal string height of 7-1/2" (190.5mm) to 7-3/4" (196.mm) and a reasonably normal backcheck block. If your piano falls out of these parameters, then you will need to use trial notes to be sure that the dimension is correct.

   ii. Locate strike line.

1. On each trial hammer, rotate the hammer so that the centerline is perpendicular to the keybed (bench).
2. Move the jig so that the line on the jig is on the line of the hammer. (See Fig. 12)
    a. Adjust the rotation of the hammer so the line on the hammer and the jig are parallel in angle as well as on top of one another.

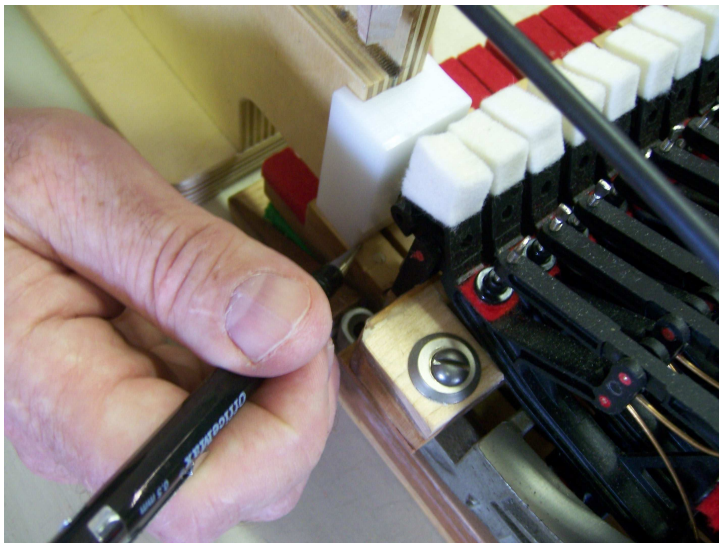


Fig. 13

Marking location of backcheck line on key

iii. Mark the backcheck line.

1. Make sure the back of the key is down on the back rail felt.
2. Move the slide on the jig down so it is on the back check block.
3. Mark the backcheck block from the slide using a pencil. (See Fig. 13)
4. Mark all trials in this fashion.

Connect the marks on the trail keys with a straight edge and pencil. (See Fig 15 & 16)

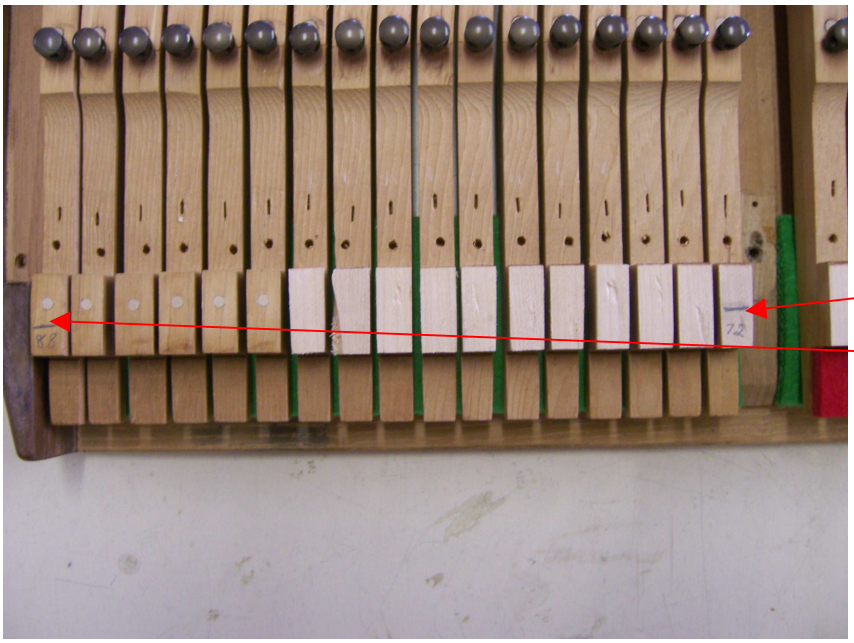


Fig. 14

First and last keys (trial keys) markings for backcheck line

Fig. 15

Drawing back check line for keys 1 to 72

Fig. 16

Marking back check line for keys 72 to 88

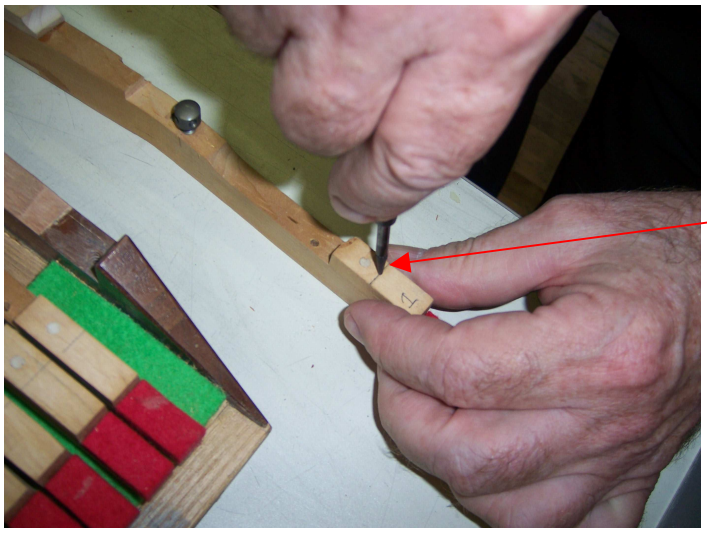


Fig. 17

Marking center of key for back check wire drilling

k. Punch the backcheck line.

   i. Use a center punch to mark the backcheck block.

      1. This is because when you drill on an angle you need the divot left by the punch to keep the drill from sliding down the angled surface of the backcheck block.

      2. Punch in the center of the key. (See Fig. 17)

Fig. 18

Preparing for back check drilling in keys

11. Drill for backcheck holes.

    a. Set up drill press for backcheck drilling. (See Fig. 18)

        i. Use Backcheck Angle Drilling block.

            1. Clamp to the drill press table.

        ii. Insert a #31 (.120" or 3mm) drill bit into the chuck of the drill press.

        iii. Set up the height of the table so that the drill end is approximately 1/8" (3mm) above the backcheck block on the key.

        iv. Set up the stop in the drill press so that the drill stops approximately 1/16" (1.5mm) above the Backcheck Angle Drilling block.

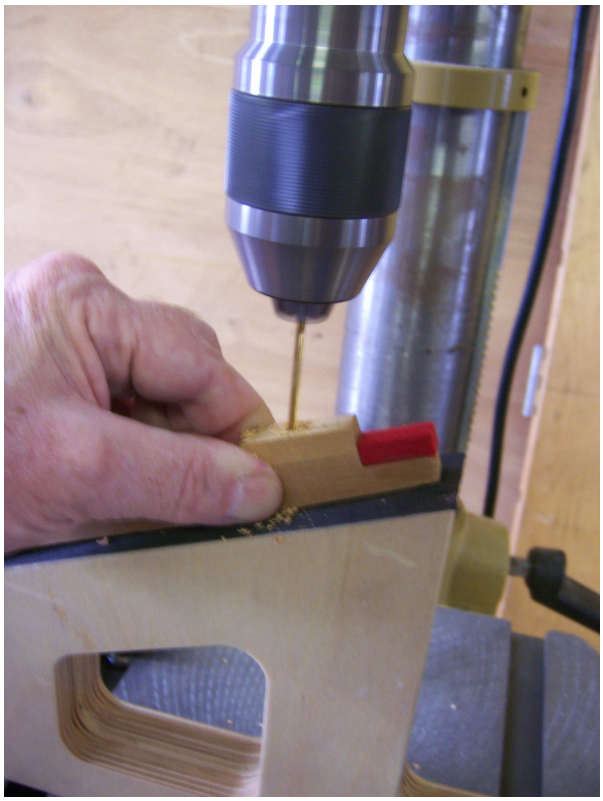


Fig. 19

Drilling back check holes

b. Drill the keys. (See Fig. 19)

   i. Place a key on the sand papered surface of the drilling block.

   ii. Locate the key under the drill by eye.

   iii. Drill to the bottom of the key clearing the flutes of the drill as necessary.

   iv. Drill all 88 notes.

12. Install back checks.

   a. Note: The drill press is used only as a press in this procedure. Do not turn on the drill press to press the backcheck and wire into the hole in the key. It is best to unplug the drill press for this procedure.

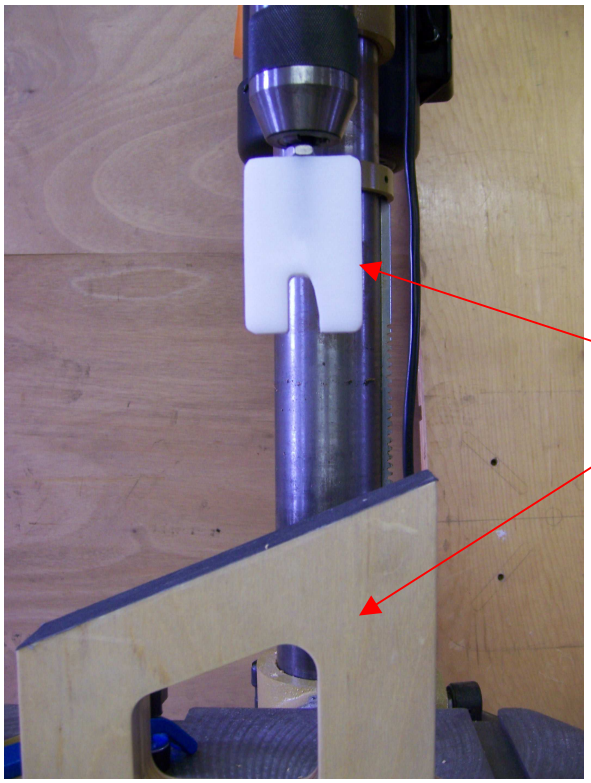


Fig. 20

WNG backcheck inserter and WNG back check angle block

b. Setup drill press with Backcheck Inserter. (See Fig. 20)

   i. Put Backcheck Inserter into the chuck of the drill press and tighten. Make sure that the body of the Inserter is against the jaws of the chuck.

   ii. Set table so that the wire of the check is about 1/8" (3mm) above the hole in the key when the backcheck is in the inserter.

   iii. Clamp everything firmly so nothing moves during installation.

c. Determine backcheck height.

   i. Setup keyboard so that you can measure backcheck height correctly.

      1. Make sure that the key height at the front of the key is correct.

      2. Make sure that the key height at the back of the key is correct.

3. Make sure that the dip is correct (Use white notes to set backcheck samples for height) on all samples.

4. Use the WNG weighted key dip block to hold the front of the sample key down against the front rail punching. (See fig. 21)

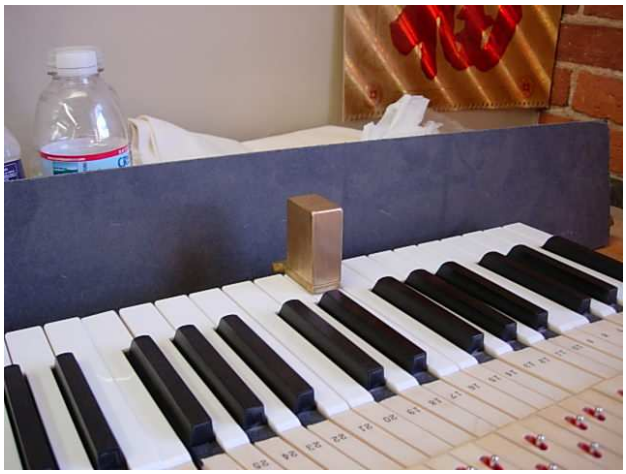


Fig. 21

Setup keyboard for back checks

ii. Setup the backcheck height jig.

1. Determine the hammer bore distance.

    a. Measure the hammer from the center of the shank to the tip of the hammer.

    b. Note that the bass hammers are not the same hammer bore as the treble hammers.

    c. If you have done a custom bore the hammer bore will be different in each section.

2. Set the top screw to the length of the hammer bore.

    a. Measure from the centerline flat (in groove) to the top of the flat head screw. (See Fig. 22)

3. Determine the length of the hammer tail.

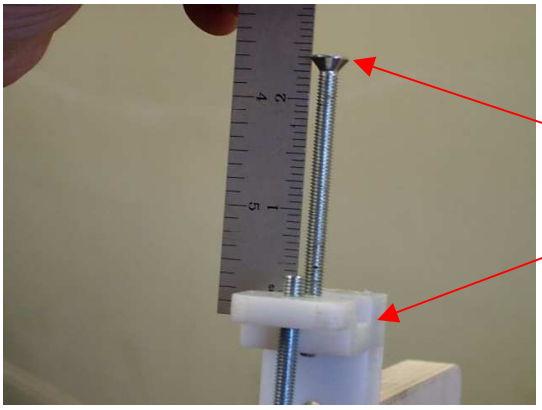
    a. Should be 1" (25.4mm). (See Fig. 23)

4. Set the bottom screw to the length of the hammer tail.

a. Measure from the centerline flat to the top of the flat head screw. (See Fig. 23)

Fig. 22

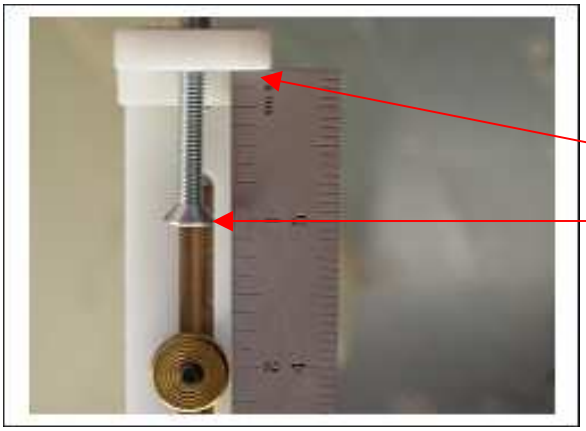
Adjust top screw to hammer bore length



Measure from bottom of groove to top of screw

Fig. 23

Adjust bottom screw to hammer tail length



Measure from flat area to the bottom of the screw

iii. Use jig to determine the backcheck height.

1. Measure the string height in the appropriate section.

a. Make sure that the hammer bore screw is adjusted correctly for the section you are measuring.

b. Measure the middle of the section. (See Fig. 24)

i. Often the string height is not the same at the opposite ends of a section.

ii. By measuring the section in the middle you get a good average of the height of the section.

iii. Do not use this method if there is more than 3/32" (2.4mm) difference between the string heights at the ends of the section.

iv. In this case, it would be better to take 2 or 3 equally spaced measurements in that section.

Fig. 24

Measure string height

2. Use the jig to determine the distance; the backcheck must protrude from the key.

    a. Make sure that the keyboard is setup correctly as in step C-i-1. (Page 21) (Key at full dip)

    b. Place the jig, as adjusted over the key, so that the top screw is approximately where the centerline of the hammer would be when striking the string. (See Fig. 25)

    c. Use a 6" (150mm) ruler to measure the distance from the bottom screw to the hole in the key.

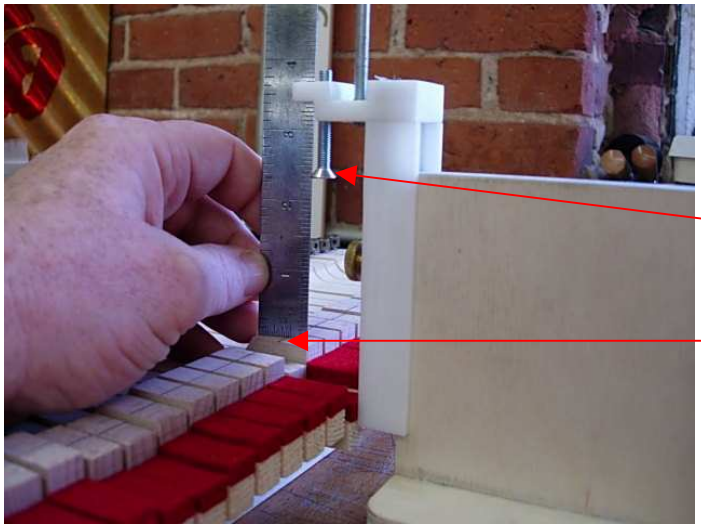


Fig. 25

Measure from screw to key to determine back check height

3. Mark the backcheck height distance on the back check. (See Fig. 26)

    a. Use a felt tip or Sharpie to make an easily seen line on the backcheck wire.

Fig. 26

Transfer measurement from Fig. 25 to backcheck

Fig. 27

Pressing the backcheck into the key

iv. Set up drill press stops for backcheck height.

Press the back check into the key to the line you have marked. (See fig. 27)

Use the backcheck, you have inserted, to set up the stops on the drill press so all backchecks can be inserted to the same height. (See fig 28)

Fig. 28

Setting the depth for the backchecks

d. Insert Backchecks.

i. Once the height setting is achieved, press all the backchecks into the keys for that section. Remember to re-check the backcheck height for each section.

1. Again, use the drill press only as a press. There is plenty of leverage in the drill press to insert the backcheck. Under no circumstances should you turn on the drill press!

2. Place the backcheck into the Inserter, facing towards the front of the key, with the wire in the top of the hole in the backcheck block.

3. Rotate the handle on the drill press to press the back check into the key.

ii. Go down the keyboard repeating until all sections are done.