

SECTION I

WURLITZER ELECTRONIC PIANOS

MODELS 200, 203, 203W, 205V, 206, 207, 207V, 214, 214V & 215V

SPECIFICATIONS AND DESCRIPTION

MODEL 200, 200A (PROFESSIONAL PORTABLE)

Keyboard Range:	64 Notes, A-13 thru C-76
Height (From Floor to Top of Keys With Legs):	28 5/8"
Height of Case (Less Legs):	7 1/8"
Height (From Floor to Top of Case, Not Including Music Panel):	33"
Overall Width:	40"
Overall Depth:	18 9/16"
Weight: (Less Legs and Pedal)	56 lbs.

Legs: Removable chrome plated steel legs, two of which have leveling glides.

MODELS 203, 203W, 206, 205V, 206, 207, 207V, 214, 214V, 215V & 270

The Models 203 and 203W are home consoles. For Group Piano Instruction, the Model 206 is the student console and the Models 205V, 207 and 207V are teacher's consoles. The Models 214, 214V and 215V are classroom consoles. The Models 207V and 214V have the switches, wiring and plugs installed for use with the Model 208 Key/Note Visualizer. The Models 205V and 215V are similarly equipped to operate the V-500 Key/Note Visualizer. The Model 270 is a butterfly grand using similar internal assemblies as the Model 200.

Keyboard Range:	64 Notes, A-13 thru C-76
Height (From Floor to Top of Keys):	28 5/8"
Height (From Floor to Top of Keys) Model 270:	27 1/4"
Overall Height (Not Including Music Panel or Casters):	32 7/8"
Overall Height (Not Including Music Panel) Model 270:	34"
Overall Width:	40"
Overall Width Model 270:	41"
Overall Depth:	18 9/16"
Overall Depth Model 270:	37 1/2"
Weight Model 270:	Approx. 150 lbs.
Weight (With Legs & Lyre) Model 270:	160 lbs.

NOTE: The Following Information Applies to All Models Except as Noted.

BENCH:

Wood bench with removable chrome plated steel legs, two of which have leveling glides.

KEYBOARD:

Sugar Pine keyboard, naturals are covered with white Iplex plastic, sharp tops are black molded plastic.

ACTION:

Wurlitzer manufactured action, employing conventional action parts such as whips, butts, flies (jacks), dampers, etc. **Regulates Like a Conventional Piano Action.**

HAMMERS:

Three ply maple covered with mothproofed felt.

tone SOURCE:

Hammers strike steel tone producing elements, causing them to vibrate in a polarized electrostatic field.

SPEAKERS:

Following is listed the various models showing the description and number of speakers used in these instruments:

Model 200 - Two 4" x 8" oval.

Model 203 - Two 4" x 8" oval plus two 8" round or four 8" round.

Model 203W - Four 8" round.

Model 205V - Two 8" round.

Model 206 - Two 4" x 8" oval or two 8" round.

Model 207 - One 6" x 9" oval or one 8" round or two 8" round.

Model 207V - Two 8" round.

Model 214, 214V & 215V - Four 8" round.

Model 270 - Two 8" round.

(Refer to schematic diagram for matching output impedance to speaker impedance).

POWER REQUIREMENTS:

ALL MODELS - 40 watts; operated from 117-volt 60 Hertz A.C. Three wire center grounded A.C. cord standard.

TOP (ALL FOUR MODELS):

ABS (Acrylonitrile-Butadiene-Styrene) molded plastic top, hinged at the back. Secured to the keybed with three (3) screws thru the keyslip.

Model 270 has a finished all wood case (walnut).

PEDAL SUSTAIN:

Lifts dampers, permitting tone to sustain as in a conventional piano. (Detachable on Model 200 portable, built in on console models).

OPTIONAL EQUIPMENT:

Model 206 - Bench is optional, as well as the special A.C. cable, Model 8315, permitting a 206 to be taken out of a lab installation and used as a separate or individual piano.

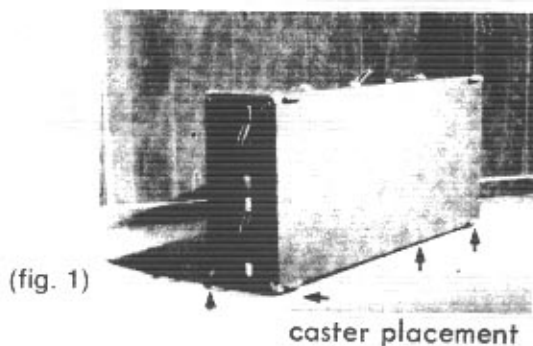
Models 200 and 203 - Bench and headphones are optional.

CARRYING CASE (FOR MODEL 200 PORTABLE):

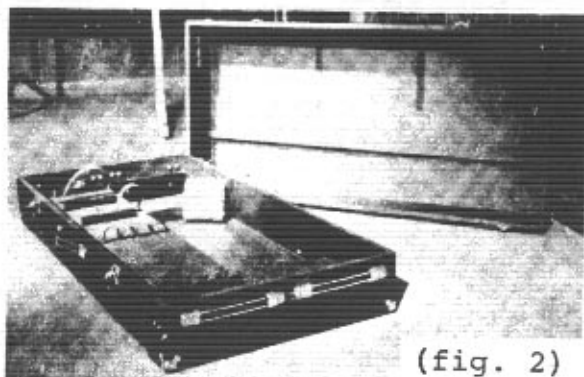
A heavy duty carrying case, Model 233A is available thru the Sales Department. See pages 6A and 6B for photos and instructions for use.

**CARRYING CASE - MODEL 233A
for
WURLITZER ELECTRONIC PIANO - MODEL 200**

- A. Remove the case from the shipping carton (fig. 1). To open, lay case flat on floor and unlatch the four locks. (Note: the locks are placed in different positions on each side of the case to avoid improper closing.)



- B. Inside the case is a box containing four 1½" chrome casters to be attached on the bottom or end of the case, as you see fit. These casters are designed primarily for use indoors on floors or carpet; if the case is to be moved on sidewalks or on any rough ground, it is suggested that you purchase 2" (or larger) rubber casters.
- C. Inside the case you will find a covered board with elastic straps designed to hold the piano legs and the expression pedal (fig. 2). During initial shipment of the empty case, this board is secured by two metal clamps located at each end. Using a Phillips screwdriver, remove these clamps (fig. 3) and dispose of them. Now take the board out of the case.



(fig. 3)

- D. Place the piano bench in the bottom of the case (fig. 4) with the bench legs alternated alongside. Slip the music panel under the elastic straps in the top as shown . . . be sure the rack lies in flat with screw arms facing you.



(fig. 4)

- E. Place the Electronic Piano over the bench parts in the carrying case with keyed toward the front handle (fig. 5).



(fig. 5)

- F. Alternate the piano legs through the elastic straps on the board (fig. 6). Then, place the expression pedal into position through the straps provided.



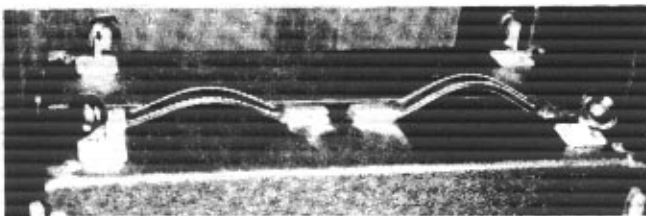
(fig. 6)

- G. Finally, place the assembly with the piano legs and pedal over the keyboard of the E.P. (fig. 7). The board will rest on the piano arm, not on the keys. Close the case.

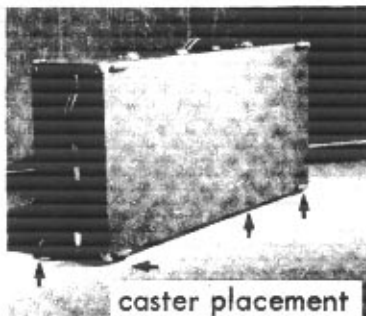


(fig. 7)

- H. Fig. 8 shows ways to install the casters on the end of the case for upright mobility or on the bottom.



(fig. 8)



PREPARATION OF THE PIANO FOR SERVICING (SEE FIG. 1 & 2 Page 4)

Unplug the piano from AC outlet. To remove the top assembly, remove the three (3) Phillips head screws that hold the keyslip down to the keybed, take out the two (2) screws that hold the music panel in place, remove the control knobs. (It may be necessary to pull the front of the top slightly forward to clear the shafts which hold the control knobs). Unplug the plastic speaker plug, located at the left hand corner on the top of the chassis assembly. Lift the keyslip portion until nearly vertical and unhook the three hinges at the back side of the top.

If the service needed is to correct a problem with the amplifier, the printed circuit board can now be removed and turned over for checking without unsoldering the leads at each end.

If the service required is regarding the keys or action, the entire chassis assembly should be removed as follows:

NOTE: If any of the four models have a screw that fastens the heat sink on the printed circuit board to the reed bar, remove the screw and discard it.

MODEL 200 AND 200A (PORTABLE): (SEE FIG. 1 & 2 Page 4)

1. Unplug the input cable at the bass end of the printed circuit board. (SEE FIG. 2 Page 4.)
2. Loosen the six screws that hold the shield to the reed bars and remove the shield by lifting straight up.
3. Unplug the white plastic plug behind the speaker plug, located on the left side of the chassis assembly. (SEE FIG. 2 Page 4.)
4. Remove the two screws at each end of the chassis that secure it to the mounting blocks. (Note: The screw located on the left hand side and toward the action bracket is larger than the other screws and has a washer located under the chassis.)
5. Remove the Pre Amp Board located at the top center of the reed bar, by loosening the two (2) 1/4" hex head screws. (200A only)
6. Lift up the entire chassis assembly, being careful not to damage the two phone jacks mounted on a bracket at the bass end.
7. Replace the front mounting screw and washer in bass action bracket. The keys and action are now exposed for any necessary regulation.

MODELS 203, 203W and 214 (HOME CONSOLES):

Follow the same procedure as for the Model 200 for steps (1) thru (7).

If there is a square white plastic nine-pin plug and socket located above the printed circuit board, unplug and remove the chassis assembly.

If there is no plug at this location, remove the three screws that hold the round mounting plates for the headphone sockets at each end of the keyboard. Also remove all cable clamps used to dress the wires leading to these jacks.

Remove the lower front panel by removing the four wood screws across the top of the panel. Unplug or unsolder all cables going to the lower front panel.

MODEL 206 (STUDENT CONSOLE):

Follow steps (1) thru (7) as described for the Model 200. If there is a square white plastic nine-pin plug and socket located above the printed circuit board, unplug it and remove the entire chassis assembly.

If there is no plug at this location, remove the three screws that hold the round mounting plate for the auxiliary headphone socket at the bass end of the keyboard and the cable clamp that dresses the wires leading to this socket. The chassis assembly can then be removed.

MODEL 207 (TEACHER'S CONSOLE):

Follow steps one, three and four as described for the Model 200. Disconnect the thirty-six pin plug and socket located near the treble end of the chassis. Disconnect all the nine-pin plugs and sockets on the chassis assembly. The entire chassis assembly can now be removed.

The five or six screws on the shield over the reed bars can now be loosened and the shield removed.

REGULATING PROCEDURE

In the keys and action of the Wurlitzer electronic piano there are approximately 3,200 parts made mostly of wood, metal and felt. These materials are specially selected and manufactured for use in piano keys and actions, but the normal wear from playing the piano, packing of the felts, and changing atmospheric conditions will probably necessitate some periodic re-regulation of the instrument.

The following pages outline the procedure for complete regulation of the Wurlitzer electronic piano. Before proceeding with a complete regulation, however, the instrument should be analyzed to determine the extent of regulation required.

1. KEYBOARD INSPECTION (SEE FIG. 2, Page 8):

First, check the felt punchings on both the balance and front pin lines and the felt on the keyboard at the back of the keys. Replace these felts if they are moth-eaten or packed excessively.

Next, inspect the entire keyboard for free movement of each key at both the balance and front pin lines. Check both natural and sharp keys by lifting them about 1/4" and dropping. If the keys do not drop back, they are tight in either the balance rail bushing or the balance rail hole.

Check the balance rail bushing first by moving the key from side to side. There should be a slight movement of the key at that point. Check the balance rail hole by moving the key forward and backward. There should be a slight chug (movement). Check the front rail bushing by pushing the key all the way down and moving it from side to side. There should be a slight movement.

2. EASE KEYS

When a piano keyboard is found to be sticking or sluggish, the cause is often due to the felt swelling either at the balance key bushing or at the front key bushing, or both. Even if just one or two keys are sticking, it is advisable to check the entire keyboard. Key easing is done by using a pair of key easing pliers which can be obtained from any reputable tuners supply house. (SEE FIG. A) Easing is executed by inserting one lip of the pliers into the opening in the key and positioning the other lip of the pliers on the outside of the key, and squeezing firmly but carefully. Wood and felt are thereby compressed to obtain a proper clearance at the pin.



When easing keys, caution should be exercised so keys are not over-eased. Over-eased balance pin bushings will cause the keys to tip, and over-eased front pin bushings will cause excessive side play, and in extreme cases, adjacent keys touching at the fronts. Over-eased keys will become noisy and will not stay properly spaced.

Sometimes sticking keys may be due to the hole at the bottom of the key (at balance point) swelling and tightening around the balance pin. The clearance should not be excessive but the key should drop freely over the pin. If the balance rail hole is tight it can be enlarged by inserting the smooth shank, not the cutting edge, of a #21 drill (.159" dia.) into the hole. This will give you the ideal size hole with less danger of making the hole too large.

(2) 4x8 SPEAKERS
202243

FUSE
77055-12

SHIELD ASSEMBLY
201838

CAPACITOR
501181

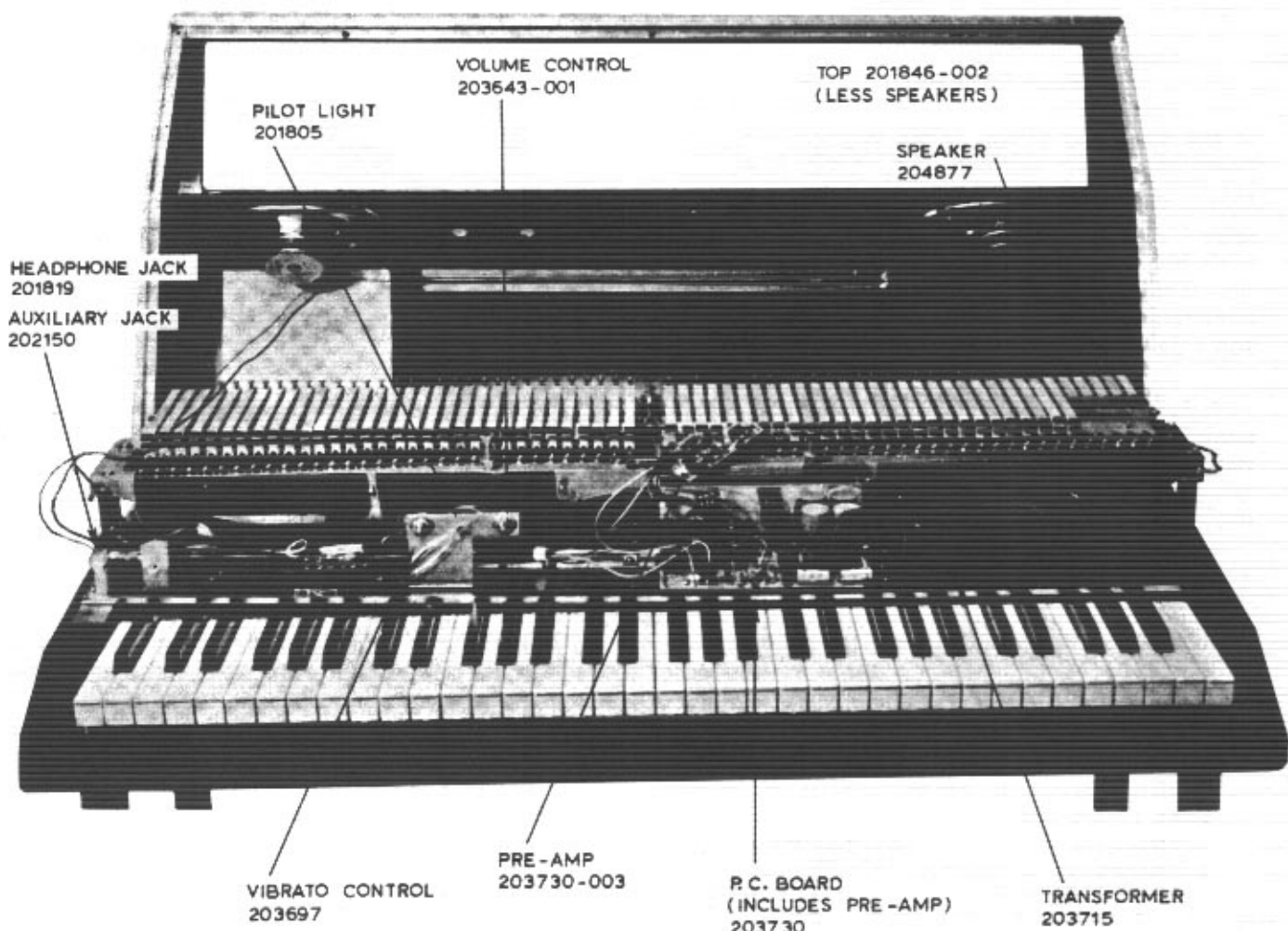
P.C. BOARD COMPLETE
201808

POWER TRANSFORMER
201807

TO REMOVE TOP

REMOVE MUSIC PANEL SCREWS.
REMOVE BOTH CONTROL KNOBS.
REMOVE THREE SCREWS FROM
UNDER KEYBED AT DOTTED
LINES. THEN HINGE BACK.
(APPLIES TO BOTH 200 & 200A)

MODEL 200



PILOT LIGHT
201805

VOLUME CONTROL
203643-001

TOP 201846-002
(LESS SPEAKERS)

SPEAKER
204877

HEADPHONE JACK
201819

AUXILIARY JACK
202150

VIBRATO CONTROL
203697

PRE-AMP
203730-003

P.C. BOARD
(INCLUDES PRE-AMP)
203730

TRANSFORMER
203715

Noisy or loose keys can be tightened with a **key bushing tightener**. Insert the tool into the key bushing and tap lightly with a small hammer. This tool may be used on the balance rail key bushing or the front rail key bushing. A key bushing tightener can be obtained from any reputable tuners' supply house. (SEE FIG. B)

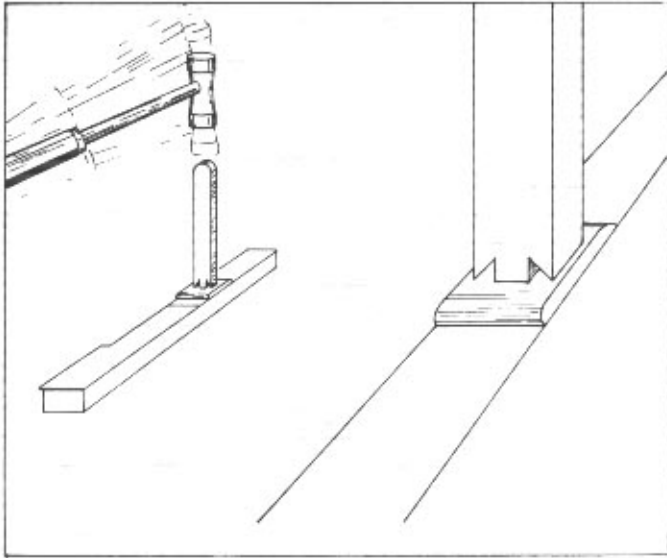


FIG. B
KEY BUSHING TIGHTENER

3. **INSPECT ACTION FOR FREE CENTERS**
First, check the butt centers by raising the butts from the hammer regulating rail and allowing them to fall abruptly, observing the movement of the butts. If the butt centers are free, the butts will fall back to the rail without any hesitation.

Whip centers are checked by depressing the full sustaining pedal to remove all damper spring tension from the whip assembly. Fully depress each key and release it slowly. If the key does not completely return, or if it returns very slowly, the whip centers are probably sluggish. Keys must, course, be properly eased before this inspection is performed.

If the action centers are sluggish, treat the action centers according to the procedure which follows.

4. **TREATING ACTION CENTERS**

If the action centers become sluggish they must be treated to restore the proper amount of freedom. If treatment is necessary, all action centers should be treated.

The treating solution consists of eight (8) parts of V. M. & P Naphtha and one (1) part of silicone liquid. V. M. & P Naphtha can be purchased at most paint stores. **Damper flange** centers, **hammer butt** centers, **fly** centers, **whip** centers and **damper sticker** centers are possible points of sluggishness and all should be treated.

Apply silicone solution freely at these points, making sure the action centers are completely wet. Application of the silicone solution can be made with a small plastic squeeze bottle with nozzle. (SEE FIG. C).

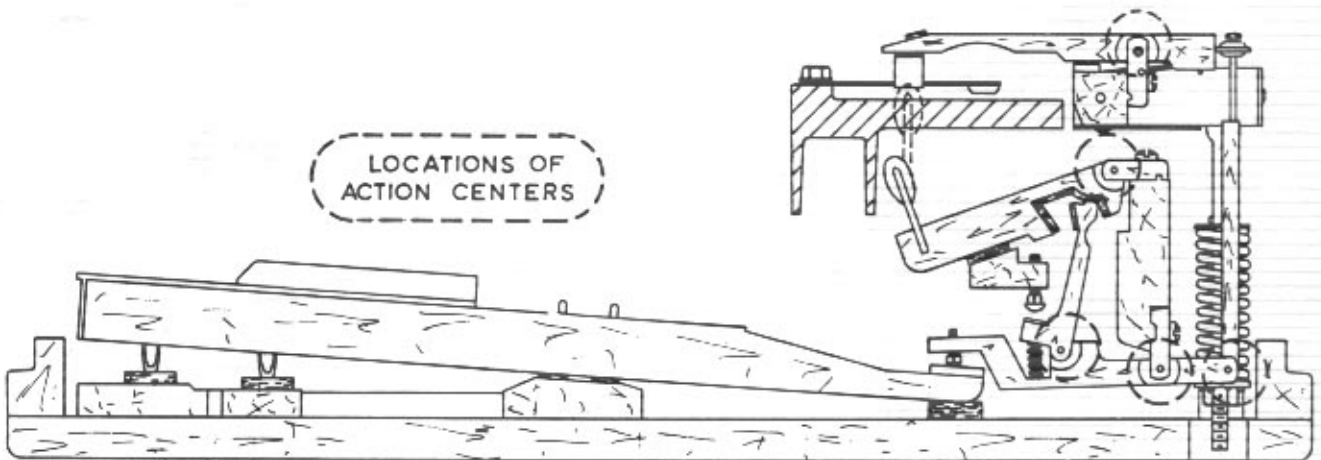


FIG. C
TREATING ACTION CENTERS

The response to the silicone solution treatment should be immediately apparent. CAUTION should be used when applying. Key covers can be damaged or reeds may go out of tune if spilled on. The silicone solution should be applied before regulation for best results, if needed. Silicone and applicator kit is available from DeKalb, Illinois Service Department.

Never re-pin a sluggish or tight action with a center pin that is smaller in diameter than the original center pin. The pin will be tight in the felt bushings and become loose in the wood. The wood will become the action center. This type of repair will not last long and will create a "rubbery" feel to the keyboard.

5. INSPECT ACTION

- A. Tighten all screws. (Does not include Regulating Screws).
- B. Check the damper levers for squeaks. Use a soft lead pencil to apply graphite to the teflon groove located under the damper lever spring to eliminate any squeak. (SEE FIG. D).
- C. Check the action completely for any broken parts, loose flanges, moth-eaten or loose felts, etc., and repair or replace as necessary.
- D. With a sand paper file, reface the hammers if necessary. Also, the hammer felt may be softened to remove a "clicking" sound by applying a solution of 75% methol alcohol (methanol) and 25% water. Apply the solution to the crown of the hammers using a plastic squeeze bottle with nozzle, until the solution soaks into the felt. Allow forty-five minutes drying time. This will "puff" up the felt fibers of the hammers and will help restore hammer crown. (SEE FIG. D). Reed bars must be removed to perform the above service.

6. SET KEY HEIGHT

The proper key height is 2" measured from the keybed to the underside of the projecting lip on the front of the natural keys. The key height is adjusted by adding or removing hard paper shims between the balance rail of the key frame and the keybed. (SEE FIG. D).

7. SQUARE AND LEVEL

After the keys have been set to the proper height, the keys are then squared to a straightedge by lightly tapping the tops of the balance rail pins toward the bass or treble as required. This may be done by using a screw driver or a small hammer.

The natural keys are leveled to the proper height above the keybed. The sharp keys are then leveled to the natural keys so the wood surface just in back of the sharp cap is even with the wood surface of the natural key. (SEE FIG. E).

8. SPACE KEYS

Keys are spaced with a forked key spacing tool by bending the front rail pin toward the bass or treble as necessary. (SEE FIG. F). The natural keys are adjusted so the spaces between the keys are uniform. The sharp keys are then spaced so they are centered between the adjacent natural keys.

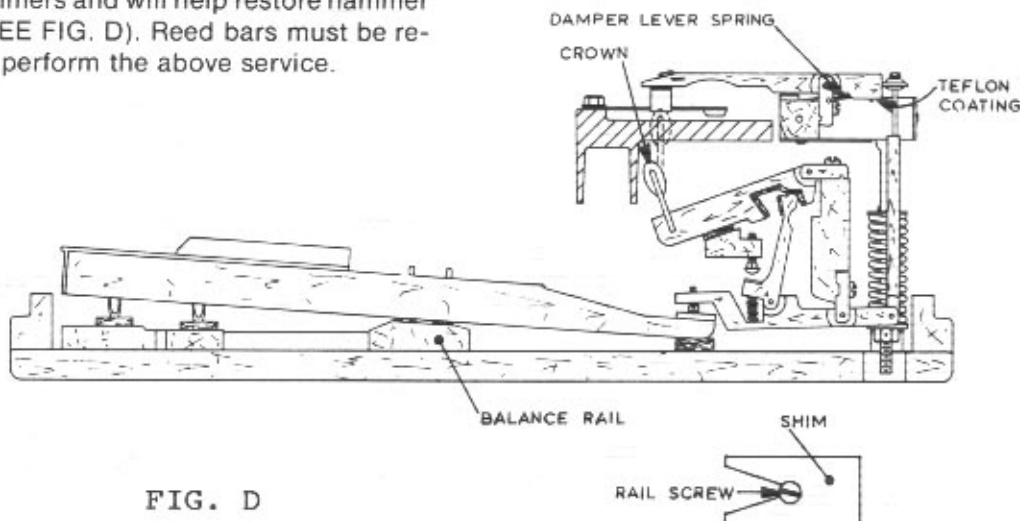


FIG. D

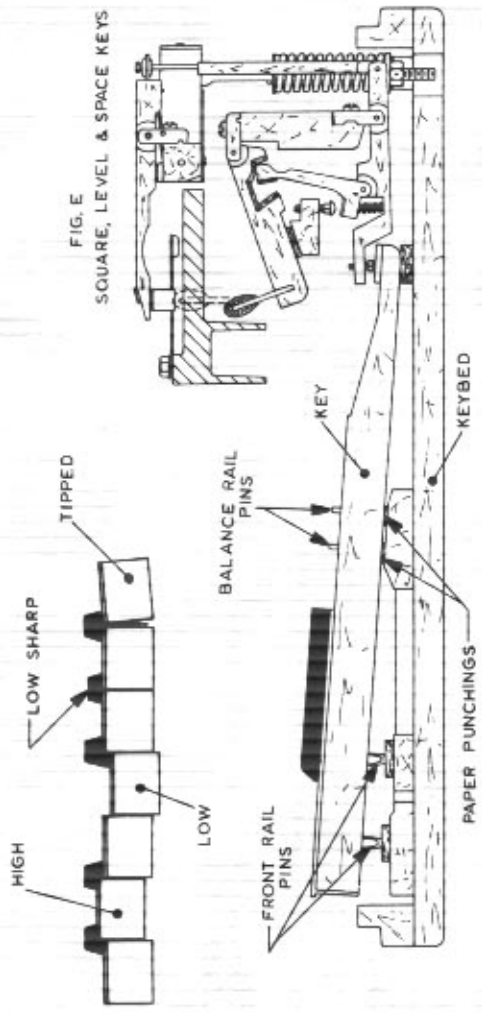


FIG. E



FIG. F

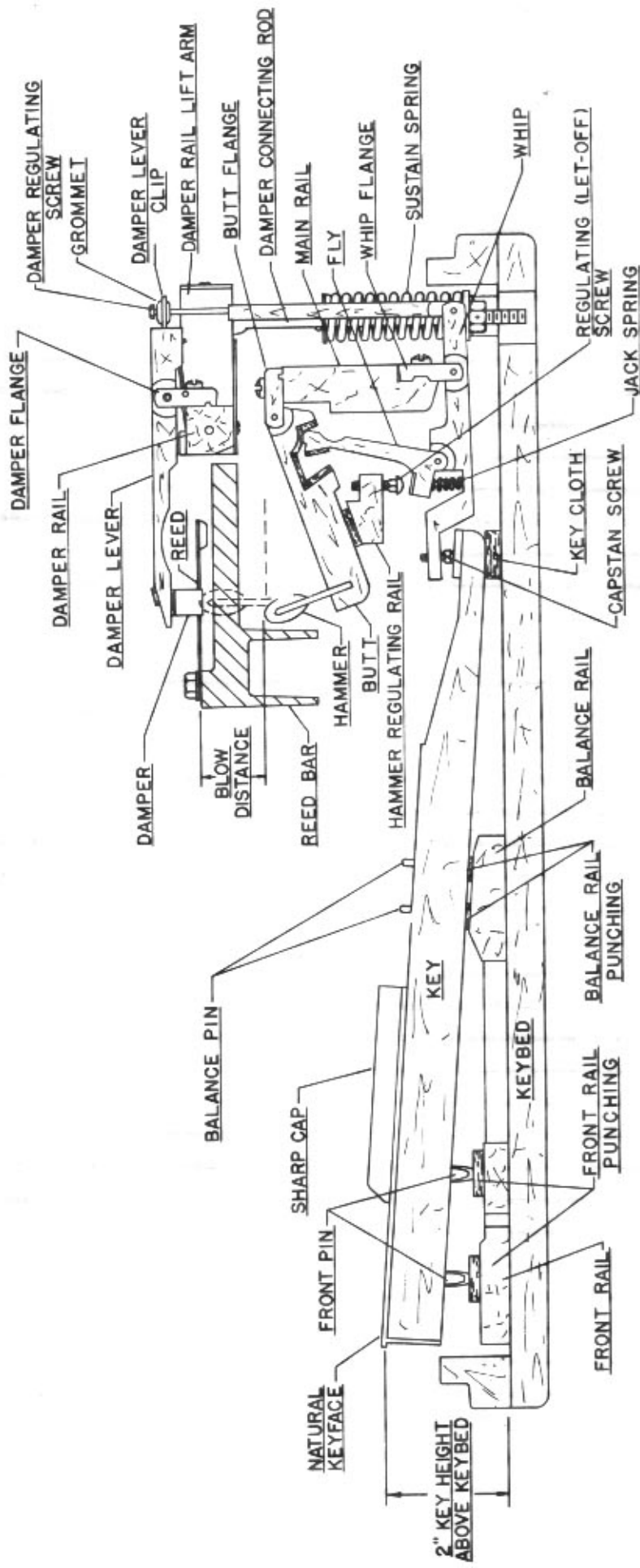


FIG. 2

As the keys are spaced, "brush" forward on the keys with the palm of the hand so the keys fall in their natural position. (SEE FIG. G.) **A Word of Caution:** After the keys are spaced, check the backs of the keys to make certain adjacent keys are not touching each other. It may be necessary to sand some keys slightly to insure the proper clearance between them.

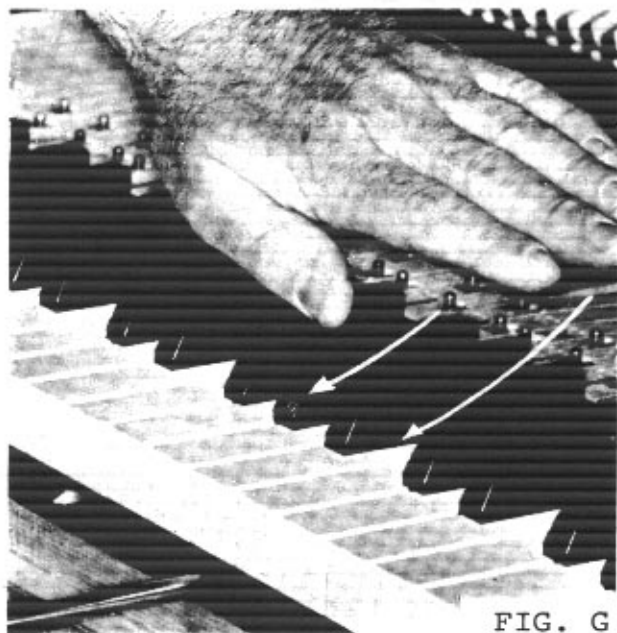


FIG. G

9 STRIKING POINT

The striking point is properly set at the factory and should require little or no adjustment in the field. If it is necessary to put in a new hammer or to reset a strike point, heating the glue line with a soldering iron will soften the glue to the point where it can be either moved for a new strike point or taken out to replace the hammer. (SEE FIG. H.)

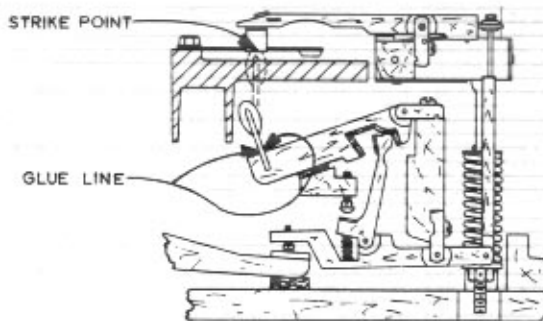


FIG. H

10. HAMMER BLOW DISTANCE

The hammer blow distance is factory-set and normally will not require adjustment, providing the hammers are down on the hammer regulating rail.

The correct blow distance is $1 \frac{5}{64}$ " measured from the tip of the hammer to the under surface of the reed. (SEE PAGE 10, FIG. 2.)

11. ADJUST LOST MOTION

A SMALL AMOUNT OF LOST MOTION should be put into the key and action of the electronic piano to make sure the jack will always return under the hammer butt on a slow return of the key. The lost motion is a $1/32$ " gap between the tip of the fly and the hammer butt covering. To adjust the lost motion, turn the capstan screw, with a capstan wrench. (SEE FIG. I). Counter clockwise adds lost motion. Clockwise to decrease lost motion.

As you depress the key, watch the front of the whip and front of hammer butt to see movement of whip before hammer butt moves. (SEE FIG. I).

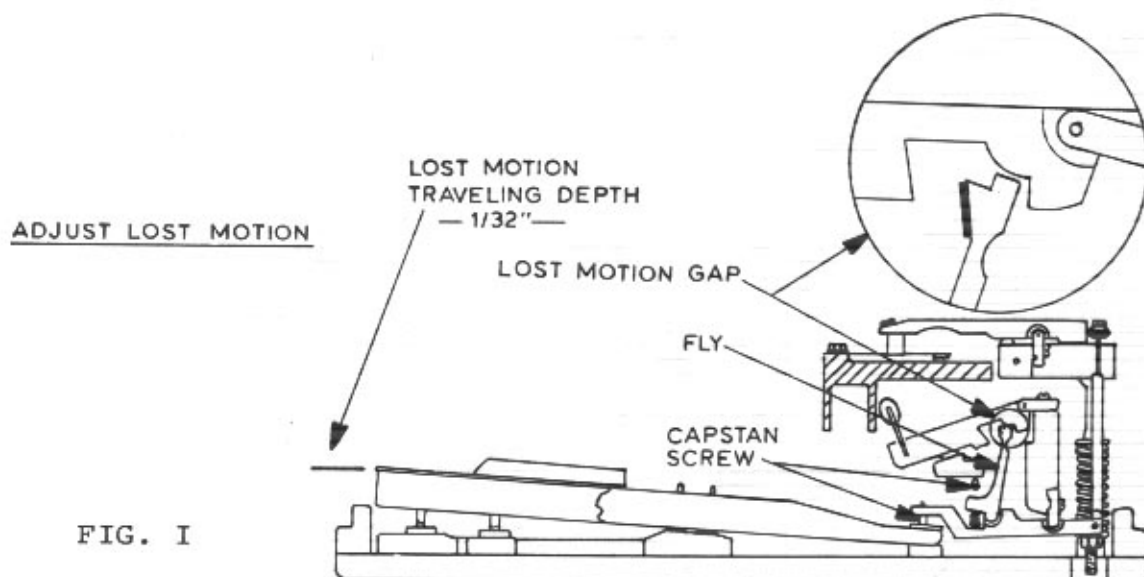


FIG. I

12. ADJUST LET-OFF

LET-OFF refers to the distance between the top of the hammer and the bottom of the reed at the point where the fly will escape the hammer butt. The present specifications for the let-off distance is $1/8''$ (plus or minus $1/32''$).

Setting the let-off is, perhaps, the most critical operation in regulating the Electronic Piano Action. Insuring that the let-off is consistent throughout an entire keyboard helps to avoid problems like loud-and-soft notes (uneven scale) and an uneven touch from note to note.

Generally, adjusting let-off requires one tool - a capstan screw wrench, which can be obtained from any reputable tuners' supply house.

To sight and measure the let-off distance, depress a piano key slowly and firmly. (SEE FIG. J). From the point where the hammer peaks-out (before falling) to the bottom of the reeds measures the Let-Off.

To adjust let-off, turn the regulating (let-off) screw with the capstan wrench. Raise the screw (counter clock-wise turns) to decrease the amount of let-off; thus allowing the hammer to get closer to the reed. Lower the screw (clock-wise turns) to increase the amount of let-off. (SEE FIG. J).

SPECIAL NOTE:

Electronic pianos that receive hard use and/or abuse are often subject to a greater degree of reed breakage (very often by professional and/or rock band musicians). It is possible to decrease the number of breaking reeds by increasing the Let-Off distance from $1/8''$ to $1/4''$. If this is done, be sure to inform the customer that the instrument will play softer than before and that it would be necessary for them to slightly increase their amplification. (SEE FIG. J).

13. KEY DIP AND BACK CHECKING

Before doing this operation be sure lost motion and let-off operations have been completed.

The blow distance on all electronic pianos is pre-set at the factory and is not adjustable. (SEE FIG. K).

The back check (see insert) is also a fixed dimension but can be set to the proper position by adjusting the key dip.

If the key dip is shallow, the fly or jack which also acts as a catcher will not make contact with the back check and the hammer will bobble. This can be adjusted by shimming up the balance rail. (SEE FIG. K).

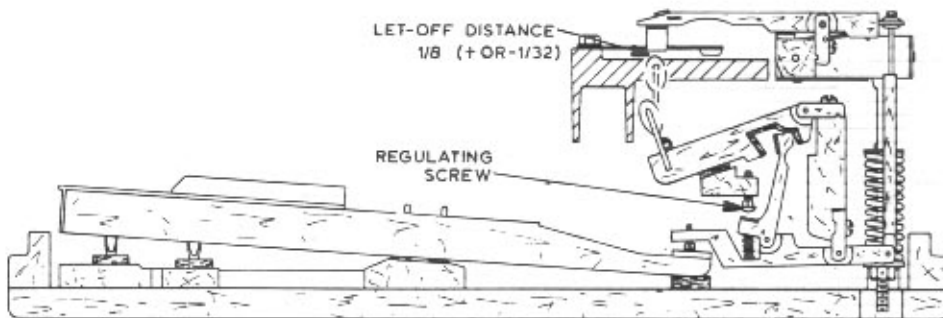


FIG. J

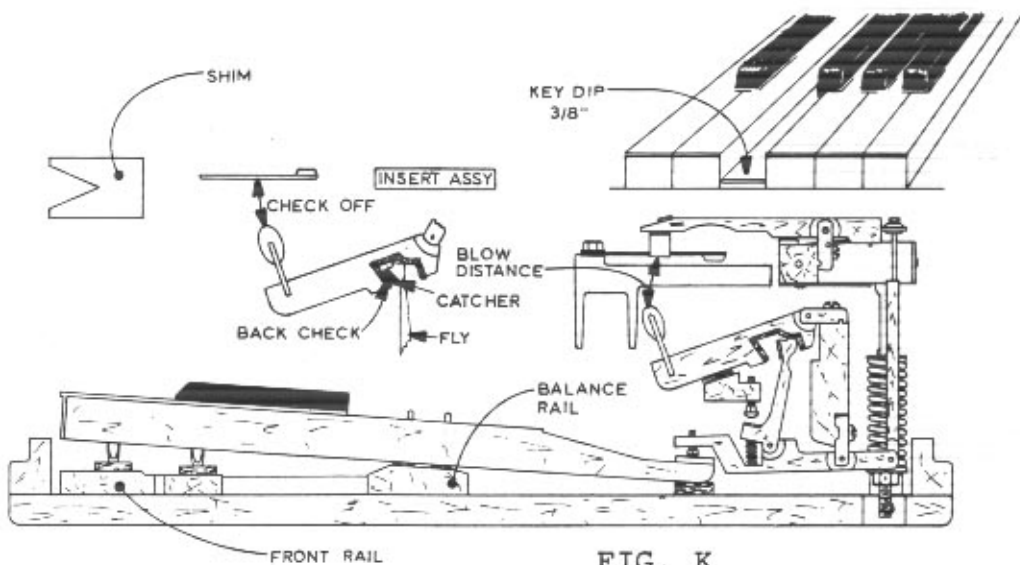


FIG. K

KEY DIP is the total travel measured at the front of the key.

If the key dip is too deep, the catcher will make contact with the back check too soon and the hammer will either block or check off too close to the reed. The hammer should check off between $3/8''$ and $1/2''$ from the reed.

If a few individual naturals or sharps are checking off too close to the reed a paper punching can be added under the felts at the front rail to obtain proper back checking.

14. DAMPER SUSTAIN ADJUSTMENT

The $7/16''$ nut on the bottom of the damper connecting rod, shown in FIG. L, is a step to limit the upward movement of the damper connecting rod. This nut should be adjusted so that a space no more than $1/32''$ exists between the bottom of the damper levers and the felt on the damper rail. (SEE FIG. L). This will insure proper damping of the reeds.

The following conditions are characteristic of an improperly adjusted **damper connecting rod nut**: (SEE FIG. L).

A. Nut Too Low

If the nut is set too low a greater space remains between the damper rail and damper lever, and as the sustaining pedal is depressed to rotate the damper rail, all of the dampers may not lift off the reeds. This results in a "dull" tone of extremely short duration.

B. Nut Too High

When the nut is adjusted too high there will be sufficient space between the damper rail and the damper levers, and some of the dampers may be held off the reeds. This results in failure to dampen some reeds.

The adjustment of the damper connecting rod nut must be performed before proceeding with the regulation of the individual dampers.

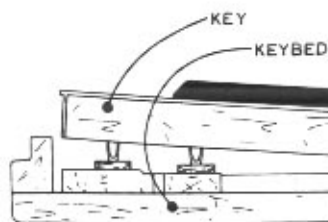


FIG. L

15. DAMPER LEVELING

When the damper connecting rod nut has been properly adjusted, the dampers themselves should be inspected for uniform lift.

Depress the full sustaining pedal and observe the lift of the dampers. If some of the dampers are "slow", that is, they lift off the reeds somewhat later than the majority of the dampers, they must be adjusted by **gluing a thin paper shim** on the bottom surface of the damper lever where it contacts the felt on the top of the damper rail. (SEE FIG. L).

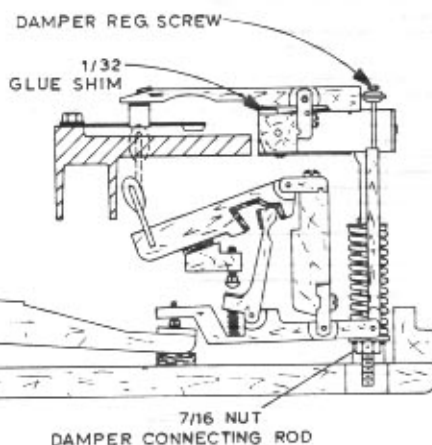
The shim compensates for uneven wear or packing of the damper rail felt and provides a uniform damper lift.

16. DAMPER REGULATION

The dampers are adjusted by turning the **damper regulating screws** which pass through the neoprene grommets at the back of the damper levers. (SEE FIG. L). The dampers are properly regulated when a gap of approximately $.035''$ exists between the top of the grommet and the bottom of the screw head. The damper regulating screw has a slotted hexagonal head, and either a screwdriver or a $7/32''$ (nut driver) may be used to adjust this screw.

17. PEDAL INSTRUCTIONS

To attach the sustain pedal to the Model 200 portable piano, thread the knurled cable nut inside the aluminum housing onto the damper connecting rod through the hole in the bottom of the instrument. Turn until it bottoms against the nut on the rod. There should be a very small amount (about $1/32''$ to $1/16''$) lost motion in the pedal before it starts pushing harder and lifting the dampers. This assures that the pedal is not holding some dampers off the reeds. To adjust



the pedal, loosen the two round head Phillips head screws that secure the top of the cable to the aluminum housing. Pull down on the cable to remove lost motion or push up to get more lost motion. The pedals are set at the factory and generally will not need adjustment unless the cable has slipped through the clamp. Some pedals have two (2) Allen head set screws that clamp the cable as it enters the bottom of the housing. However, the adjustment is the same.

On all console model electronic pianos, the pedal is built in, but the adjustment is the same as covered on the 200 portable. A cable clamp is located about eight (8) inches below the knurled nut. (SEE FIG. M).

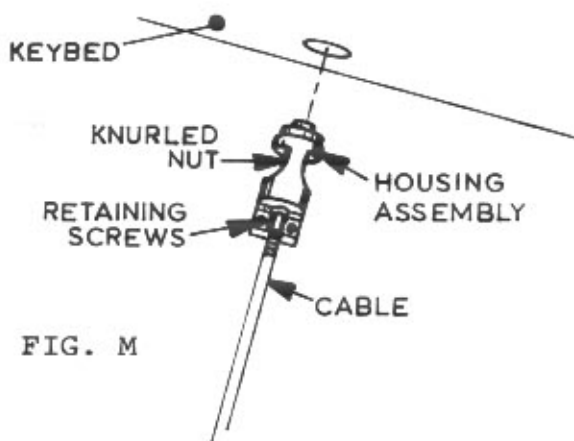


FIG. M

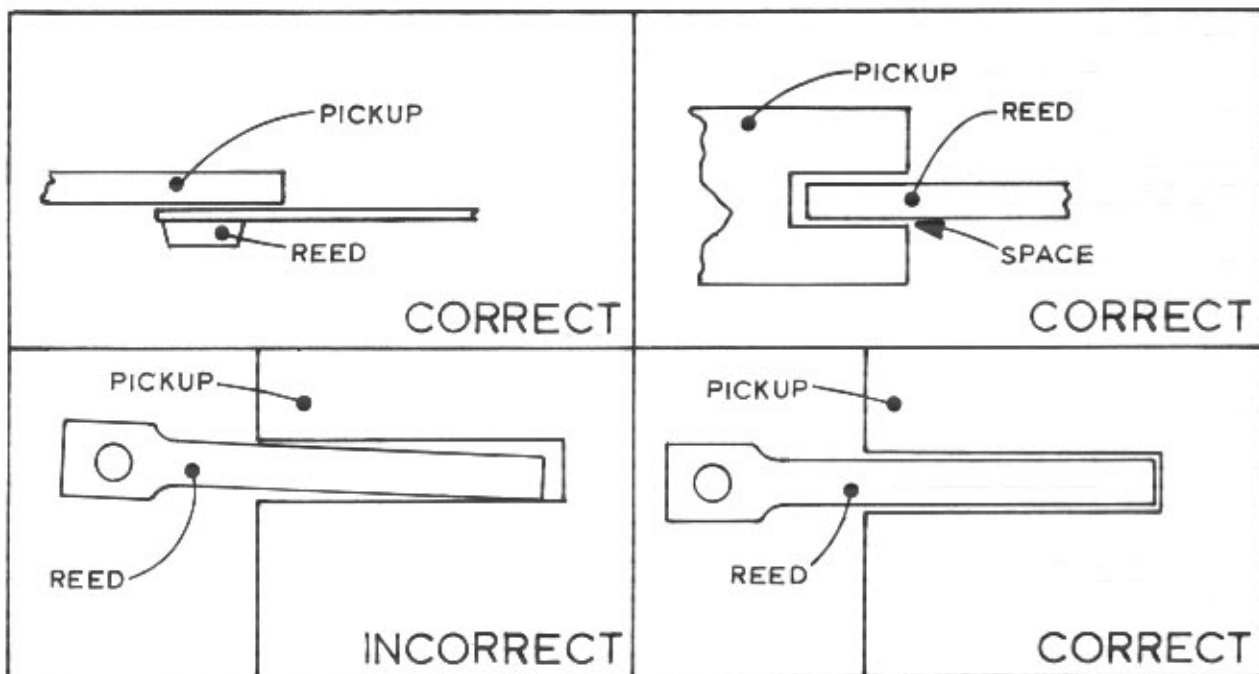
NOTE: PEDAL SHOULD BE ADJUSTED TO LIFT THE DAMPERS TO THE SAME HEIGHT, THE DAMPERS ARE LIFTED WHEN A SINGLE NOTE IS STRUCK.

18. VOICING

This is the most important aspect of the entire action regulation procedure. This insures the tonality, volume, and ring time of the individual notes are uniform and consistent. Loud notes, soft notes, and notes that have a piercing tone, will be eliminated.

Voicing is accomplished by adjusting the pickup (SEE FIG. N) so the flat surface of the steel reed and the face of the pickup are in the same plane. The same procedure is used in the bass with the lead down and the treble with the lead up. **Positioning** of the reed in this manner is very important especially on the smaller reeds.

FIG. N



When a reed at rest is positioned inside the pickup, a very strong undesirable harmonic will be generated. Reeds should be positioned as close to the center as possible (SEE FIG. N). An automotive feeler gauge makes a good tool for checking the clearance on each side of the reed to be sure it is centered in the pickup. Unequal spacing makes a reed too close to one side of the pickup and will give an undesirable loud tone.

Voicing can be accomplished, in part, by changing the relative position of the pickup to the reed (SEE FIG. O). Moving the pickup up or down adjacent to the reed will change tone characteristics of each note. Be careful not to bend the pickups up or down excessively or frequently since this will weaken it.

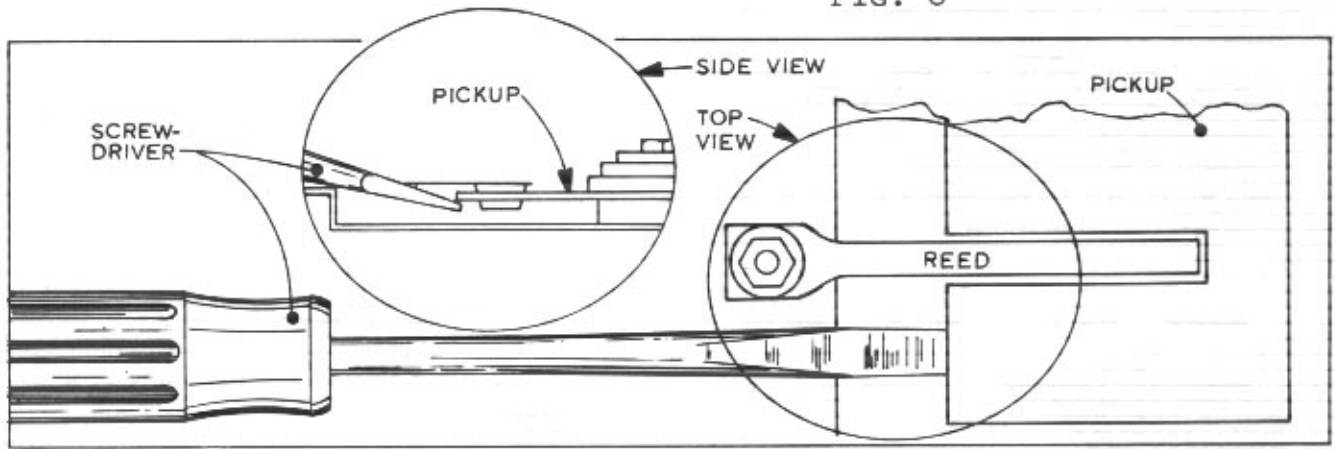


FIG. O

For notes that have a **short ring time**. Remove the reed (SEE FIG. P) to check a note with a **short ring time**. The base of the reed or the part under the reed screw should be inspected on both sides of the reed for any foreign material. The reed can be cleaned by holding a very fine grit emery paper on a flat surface and polishing both sides of the head until metal shows through. This is also an electrical ground. If you lose the ground, you will lose the volume. Any foreign material on the head of the reed will dampen the oscillation. If this does not cure the ring time, the reed should be replaced.

Changing the strike point of the hammer to get a better sound should only be attempted after the preceding steps have been undertaken. It is possible to improve the tone and sustain of a reed by being certain that the strike point is correct. First, loosen the reed bar screws. This will allow the reed bar to be moved backward and forward. From this you can determine which way the hammer needs to be moved. To move the hammer, take a soldering iron and heat at the base of the hammer stem where it meets the butt assembly. (SEE FIG. Q). Thermal glue is used here. After glue is soft, the hammer stem can be moved forward or backward to the appropriate location.

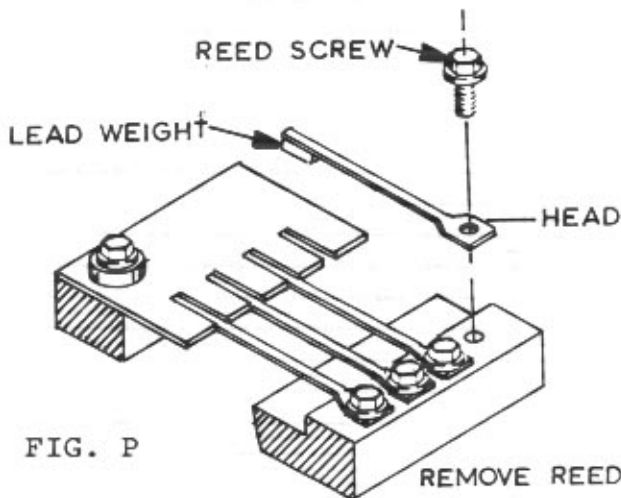


FIG. P

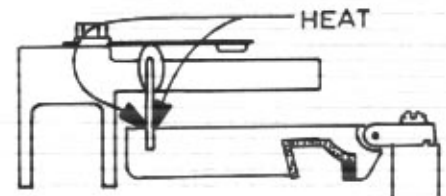


FIG. Q

19. TUNING THE ELECTRONIC PIANO REED

The REED is the tone element of the Wurlitzer Electronic Piano. Its tuning position in the instrument and how this position relates to the pick-ups are essential to the tonal quality of the piano.

INSTALLING NEW REEDS — The reed's retaining hole is slightly larger than the diameter of the reed screw. When putting a new reed in place for tuning, be sure that the reed is as far "BACK" as it will go. (SEE FIG. R). Additionally, before beginning to tune, insure that the reed screw is tight. NOTE: the reed screw washer is dish shaped. This washer should **not** be flattened. Tightening the screw after the reed has been brought up to pitch will cause it to go sharp (and lead will need to be added to the tip and the reed retuned).

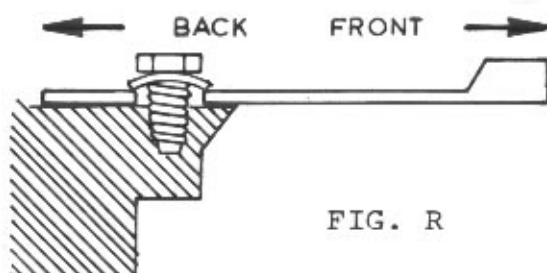


FIG. R

Tuning is accomplished by removing the lead from the reed tip (by filing or scraping a small amount at a time). Continue to remove the excess lead until arriving at the proper pitch. If the reed is flat, the pitch can be raised by removing lead from the tip. If the reed is sharp, the pitch can be lowered by adding lead to the tip or moving the reed as far forward as possible.

While removing the excess lead, it is very important to maintain the PYRAMID shape of the tip. (SEE FIG. S.) Remove lead from the tip by filing or scraping a small amount at a time. Try to remove the lead evenly so the weight remaining on the tip will be evenly distributed. (SEE FIG. S.) A lop-sided tip can affect the motion of the reed as it vibrates.

When tuning a new reed, removing too much lead will cause the pitch to be sharp (too high). Moving the reed to the "FRONT" will drop the pitch (from 2 to 5 cents) and permit fine tuning without having to add additional lead to the tip.

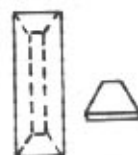
If moving the reed to the "FRONT" does not sufficiently lower the pitch, remove the reed, add lead to the tip by using a soldering iron and rosin core solder. A low heat is best, so a small drop of solder can be added without melting the lead to make it flat, and then fine tune the reed by filing it to remove the excess.

When tuning new reeds, pitch tolerances should be kept to within 5 cents (-2 to +3). The tuning process is often made easier with the use of a strobe-type tuner.



FIG. S

PROPER
REED TIP
PYRAMID



20. REMOVING ACTION PARTS

It is **not** necessary to remove the action from the piano to replace a **butt assembly** or a **damper lever**.

It is necessary to remove the action to replace a **whip assembly**.

A. Butt Assembly (SEE FIG. 2, PAGE 8)

Disconnect the damper regulating screw from the related damper lever and one on each side of it by pulling the grommets out of the wire clips. Remove the butt flange screw with a slim screwdriver between the backs of the damper levers (or remove the related damper lever for better accessibility), rotate the back side of the butt between the main rail and the damper rail and pull out.

B. Damper Assembly (SEE FIG. 2, PAGE 8)

Disconnect the damper regulating screw from the damper lever by pulling the grommet out of the wire clip. Remove the damper flange screw and lift the damper lever up and out of the action.

C. Action Removal

1. Unplug the 2 or 3 wire A.C. plug located at the bass end.
2. Remove the metal shield over the reed bars.
3. Remove the four screws that secure the extreme bass and treble ends of the entire metal amplifier chassis assembly to the mounting blocks.
4. Remove ground screws on chassis.
5. Unplug the input cable from the printed circuit board on 200 only. For 200A, use a 1/4" nut driver and two screws that hold the Pre Amp assembly board located between the reed bars.
6. Lift the chassis and pull it forward approximately one inch and remove.

7. Remove the shoulder bolt that connects the damper connecting rod to the damper rail lift arm, noting the location of the felt washer and the spring washer.
8. Remove the two screws behind the damper rod sustain spring that secures the main rail support bracket to the main rail.
9. Remove the three screws (one in front and two in back) that fasten the end action brackets to the mounting blocks. If there are cable clamps fastened to the front of the reed bars, remove them.
10. The action is still being held down in the center. Take a long 10" blade, 3/16" diameter Phillips head screw driver and remove the screw that secures the bottom right side of the center action bracket to the whip stop and keybed. (see photo, page 16). The screw driver must be inserted at the back left or bass corner of the treble reed bar just in front of the treble damper rail.
11. At this point, the whole action reed bar assembly should be free to be lifted out of the piano. Also, you can see the tip of the screw driver going into the screw head by looking at the space located between the middle support bracket and the 33 whippen.

D. REMOVE THE WHIP ASSEMBLY

Turn the action upside down so it rests on the damper levers. Remove the screw at each end of the whip stop and turn it approximately 90°. Slide the damper regulating screw and grommet out of the clip in the damper lever. Remove the whip flange screw and the entire whip assembly will come out.

IMPORTANT: When installing the new whip, be sure the tip of the jack (or fly) is placed properly in the butt before screwing the whip stop back in place.

E. Installing Action Assembly

Place action assembly back in place - start mounting screws, but do not tighten. Be sure all jacks are placed properly by depressing each key. If a key is jammed, the jack is not installed correctly and must be adjusted or "tripped". After the keys are operating, tighten mounting screws.

Connecting External Amplifiers for Model 200 only

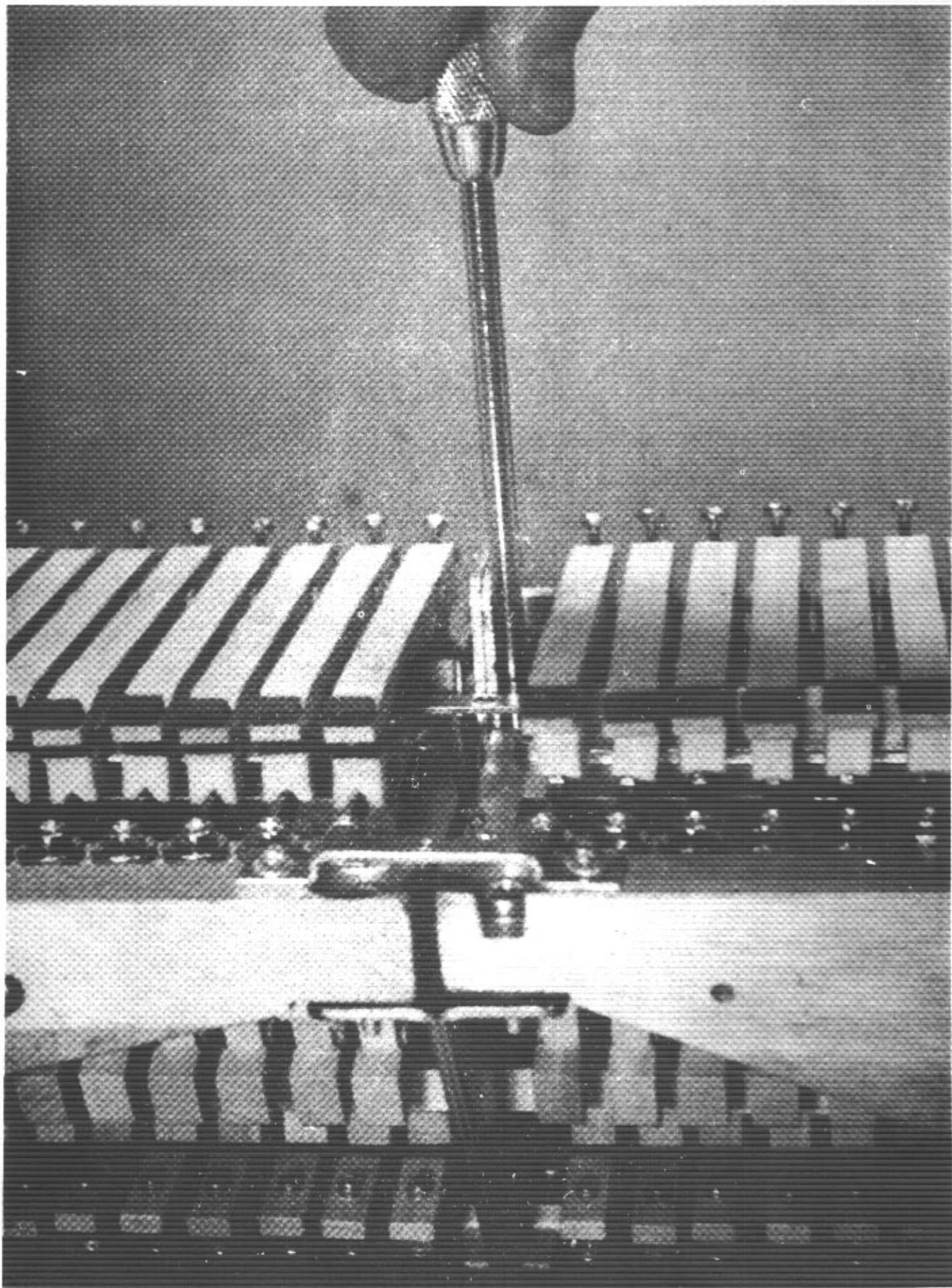
The most satisfactory point to obtain a signal for driving any external amplifier is at the external output jack. As the piano is wired, this signal is taken from point 7 (signal) and point 1 (ground).

In early production amplifiers, the resistor between points 6 and 7 (R 75) should be changed

to a 6.8K, the resistor between points 1 and 7 (R 76) should be changed to a 2.2K, and the 5 mfd. capacitor between points 5 and 6 should be removed and replaced with a jumper wire. The signal output level will now be approximately 0.5 volts.

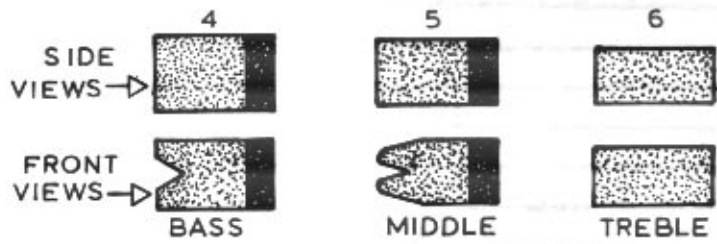
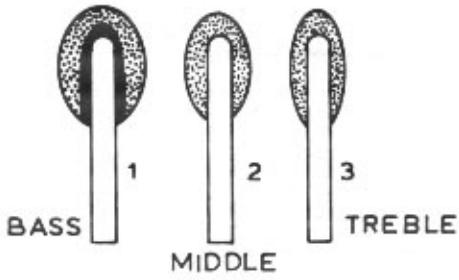
Should the external amplifier require more output signal to drive it, the position of the 6.8K resistor and the 2.2K resistor may be reversed.

Refer to "amplifier-piano-P.C. board assembly" drawing #201808-S-1 E-1 in the back of the service manual.

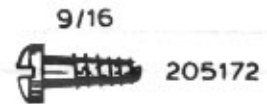
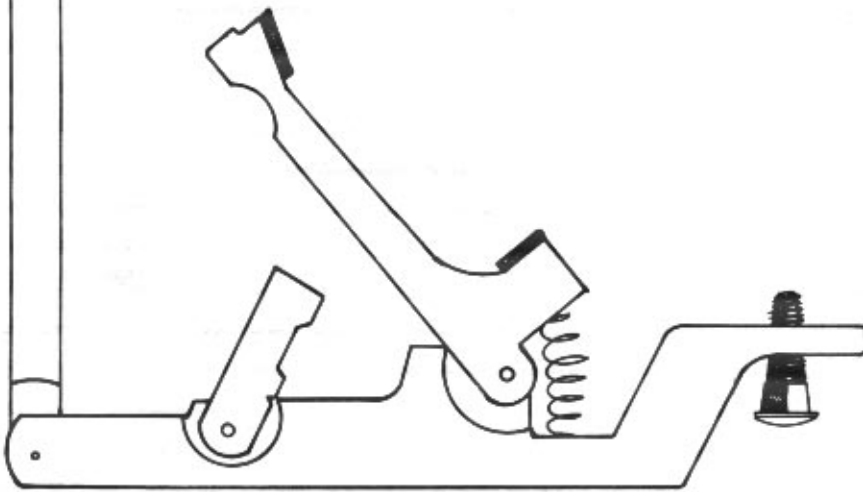
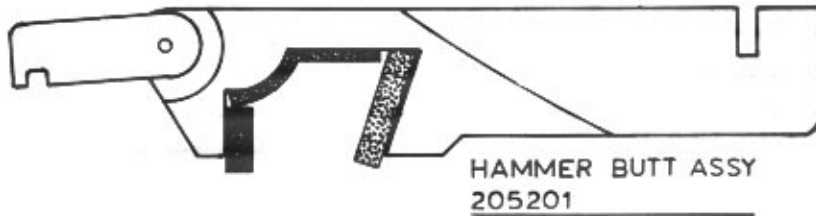


ACTION PARTS

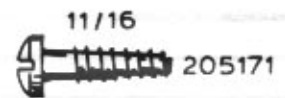
HAMMERS



DAMPER FELTS



WHIPPEN & DAMPER SCREW



HAMMER BUTT SCREW

PARTS	
FOR HAMMERS & DAMPER FELTS	
1. 201775	4. 201792
2. 201785	5. 201793
3. 201782	6. 201794

MODEL 270 BUTTERFLY GRAND
ELECTRONIC PIANO

ITEM

Key Easing pliers
Punch for tightening key bushings
Key bushing wedge clamp
Sandpaper file
Tweezers 8"
Capstan wrench
Screwdriver with finder
Franklin Tite Bond (2 os. bottle)
Long fine needles pliers
Felt cutting knife
Soldering iron E.P. tuning
Extra tip

ANY LOCAL HARDWARE STORE

Solder for adjusting reeds
Exacto knife - tuning reeds
Tool & dye file for filing shank of reed
Feeler gauge - flat blade type
No. 21 drill (.159 dia. for bal. hole for drill part
mounted in wood handle.)
Xcelite Nut driver 1/4"
Xcelite Nut driver 5/16"
Xcelite T (Handle)
Xcelite Nut driver 7/16"
Xcelite Nut driver 7/32"
Phillips screwdriver — 10" shank #2
4" Nickelson Mill bastard - tuning
Tack puller (Fuller #409) for lifting keybeds
6" Ruler with slider

WURLITZER SERVICE DEPARTMENT

Key dip block
Silicone Kit
Holly Springs straight edge
Supply of paper punchings - front rail - assorted
Supply of paper punchings - balance rail - assorted
Supply of paper shims - keybed - assorted
Service Manual - up-to-date for 200A
E.P. notes (green)
Strobe tuner

1. To remove the **MUSIC PANEL**, remove the two screws located behind the panel and lift upward. See Fig. 1 p. 19 (it is **not** necessary to remove the music panel to service the piano.)
2. Removal of the **MUSIC DESK**. Remove the four screws located in back of the music desk. These screws run horizontally through the lip of the **BAFFLE SHELF & SPEAKER ASSEMBLY** into a hidden lip of the music desk. See Fig. 2, page 19. Slide the music desk toward the keys until the under brackets are free. Lift the music desk up and out of the piano. See Fig. 3.
3. Removal of the **TUNING PIN COVER**. Lift the cover up and out of the bracket screws. See Fig. 4.
4. Removal of the **REED BAR SHIELD**. Loosen the screws located along the front side of the shield and lift the shield up and out of the piano. See Fig. 5.
5. After removing the reed bar shield, you are now free to work on the **KEYBOARD AND ACTION**. See Fig. 6, page 19. NOTE: For regulating procedures, refer back to page 3.
6. To remove the **BAFFLE SHELF & SPEAKER ASSEMBLY**, loosen and remove the six screws located around the perimeter of the shelf. See Fig. 7, page 20. Loosen and remove the left and right bracket screws. See Fig. 8, page 20. Carefully lift the baffle shelf & speaker assembly up and out of the piano, making sure you disconnect the speaker plug. See Fig. 9 & 10.
7. After removing the baffle shelf and speaker assembly, you are now free to work on the **AMPLIFIER P.C. BOARD & MOUNTING PLATE ASSEMBLY**. See Fig. 11, page 20. Note: For electronic servicing, refer back to the Model 200A series.
8. To remove the **PRE-AMP P.C. BOARD**, loosen and remove the two hex head screws with a 1/4" nut driver. See Fig. 12.
9. To remove the **ACTION**, follow the same procedures as described under Action Removal, Page 14. Be sure to remove the center action bracket screw. See Fig. 13.

10. To remove the **AMPLIFIER P.C. BOARD & MOUNTING PLATE ASSEMBLY**, disconnect the two moxex connectors on the left and right ends of the amplifier chassis. See Fig. 14, page 20. Then remove the left and right screws located on the underside of the mounting plate assembly. See Fig. 15, page 20. Lower and remove the assembly.

NOTE: If amplifier servicing only, remove two flat head screws located on the underside, rear of piano. See Fig. 14.

NOTE: See regular texts for action regulation-or electronic servicing.

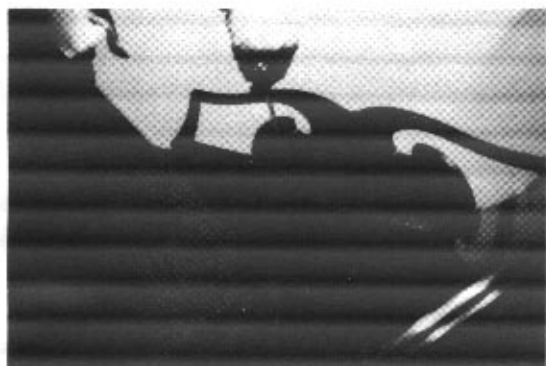


FIG. 1

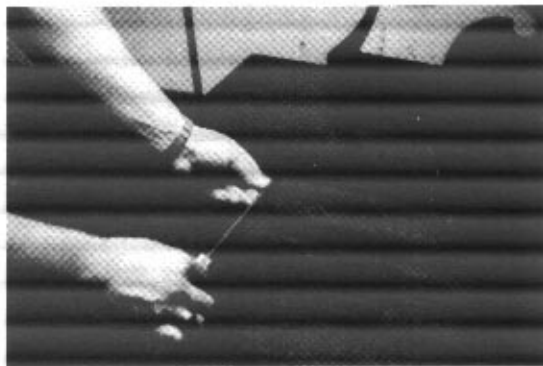


FIG. 2



FIG. 3

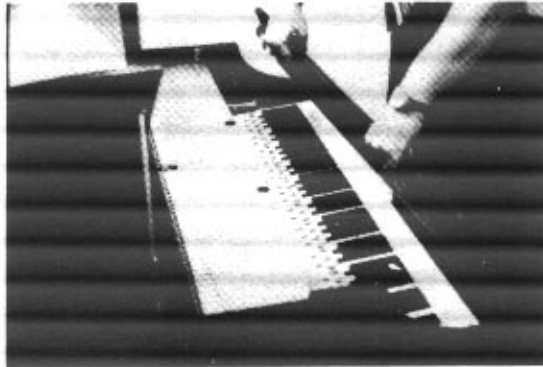


FIG. 4



FIG. 5

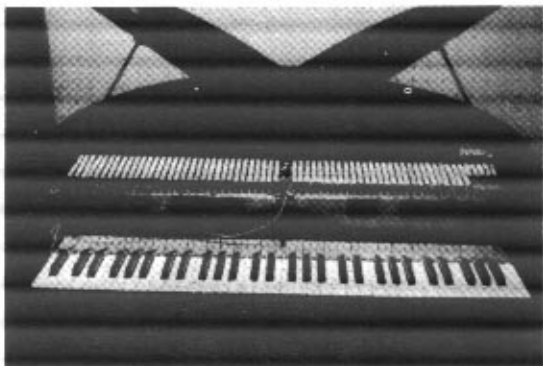


FIG. 6

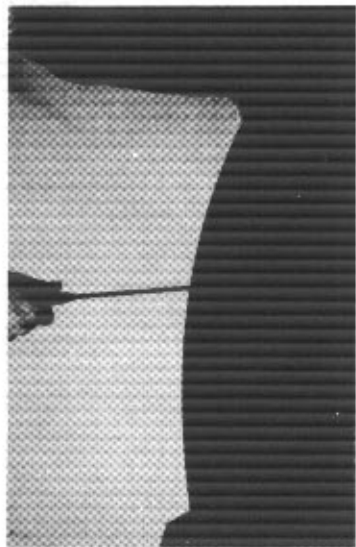


FIG. 7



FIG. 8



FIG. 9



FIG. 10



FIG. 11

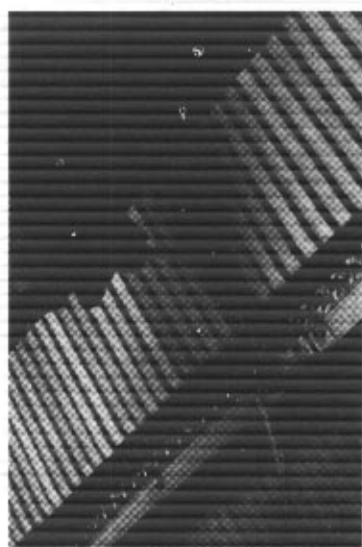


FIG. 12



FIG. 13



FIG. 14



FIG. 15

MUSIC PANEL MOUNTING
BOLTS - PT. NO. 201842

AC RECEPTACLE
MDL. 200A START S/N 110926
PT. NO. 206580
PRIOR TO S/N 110926
PT. NO. 201829
220V START S/N 111382

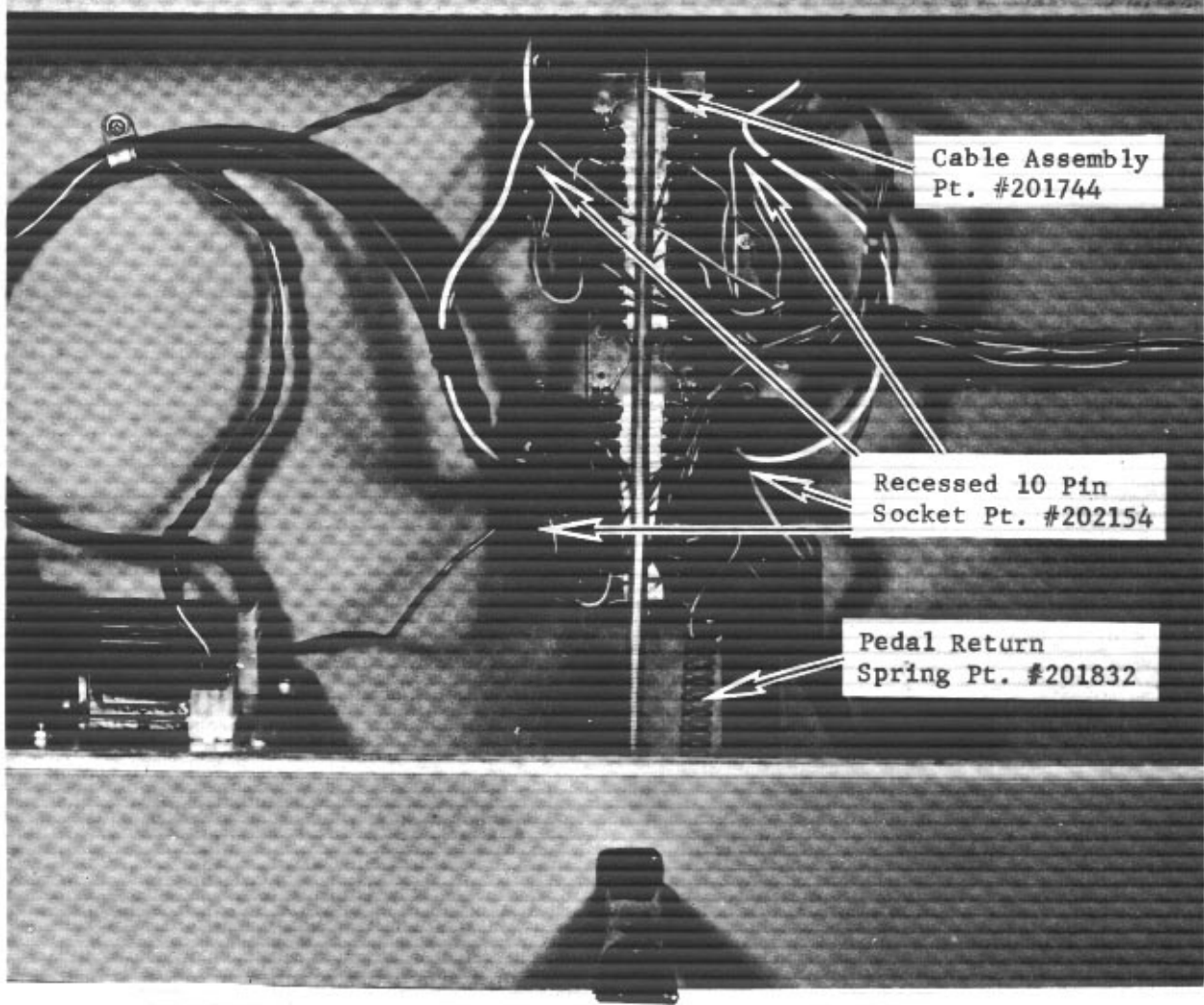
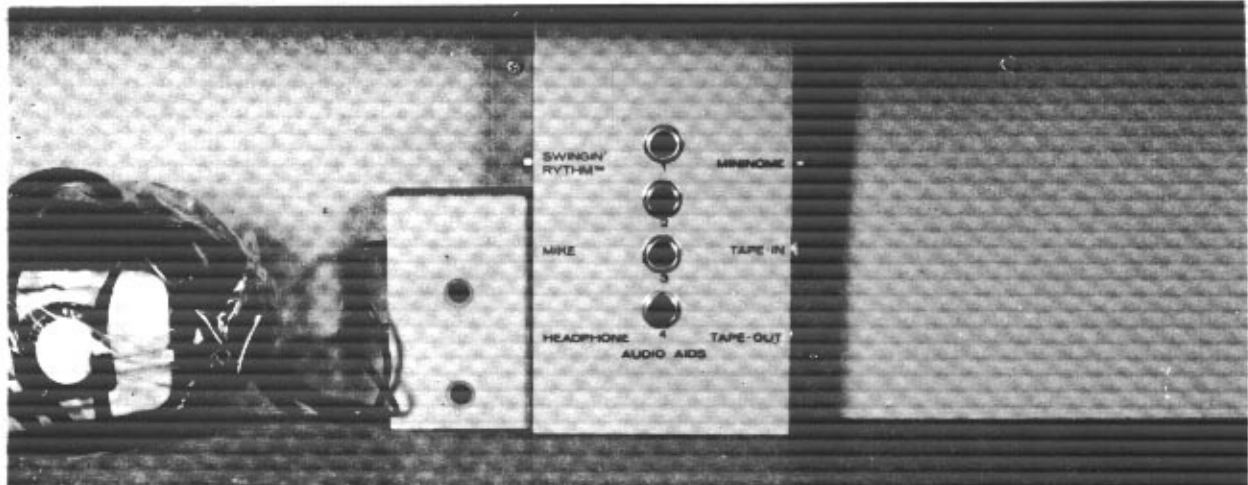
A. C. LINE CHORD
MDL. 200A START S/N 110926
PT. NO. 206545
PRIOR TO S/N 110926
PT. NO. 201859
220V START S/N 111382

CABLE ADAPTER -
PT. NO. 202266

DAMPER CONNECTING
ROD - PT. NO. 201707

PEDAL CABLE
ASSEMBLY -
PT. NO. 202265

MODEL 200



MODEL 207 with Lower Front Panel Removed. Note New Junction Box.

DESCRIPTION OF THE 207 TEACHER'S CONSOLE

Four groups of from one to six Model 206 student pianos in a group can be connected to a Model 207 Teacher's Console Piano. Each Model 206 student piano in a group is connected to the next student piano by an external jumper cable assembly. Each group of student pianos is connected to the Teacher's Console with a master cable. (SEE FIG. 5, PAGE 24).

The Model 8309 cable assembly is made up of the master cable and five jumper cable assemblies. Line voltage (117 VAC) is applied to the 207, (SEE FIG. 5, PAGE 24) and supplies power to the system through the master cable and jumper cables. There is a shielded high impedance common line for ensemble. This ensemble line collects the output of each 206 student piano for group communications. In addition, there are six low impedance lines for self. Self permits communication between student and teacher for private practice.

Twenty-four possible self line connections are available at the 207 console. One or more of these self connections can be selected for use by combinations of the "group" switch bank and the "piano" switch bank. Each 206 has its own power amplifier output and headphone coupled to its own self line. The 207 power amplifier output and headphone are switched through the "group" switch bank and the "piano" switch bank to a self line. The 206 power amplifier drives the 207 headphone, and the 207 power amplifier drives the 206 headphone. (Refer to schematics #11-0783A and 11-1137) (202821 and 202822).

A separate ensemble line from each group is connected to the Teacher's Console. The collected 206 ensemble signals on the ensemble line, and output signal from the Teacher's Console amplifier drive a corresponding group ensemble pre-amp, (TR-32, TR-33, TR-34 and TR-35). By use of one of the lighted ensemble selector tabs, the output from any of the four group ensemble pre-amps can be switched off, switched to a corresponding ensemble driver amplifier (TR-4, TR-11, TR-18 and TR-25), or switched to a mixed position, combining the outputs of more than one group ensemble pre-amps. The output from the ensemble driver amplifier drives six transistors with a common input. The output from each one of the six transistors is coupled back to an individual self line. The self lines are then returned back to the 206 headphones.

The teacher can monitor an output from any one of the four Group Pre-amps by actuating one of the group switch bank tabs. This signal is then coupled to the 207 headphone driver amplifier. The output of this 207 headphone driver amplifier is then coupled to the 207 headphone output jacks.

The Group Call Switch decreases the 206 output drive level and increases the 207 output drive level. These modified levels of drive are then applied to the circuitry for the particular mode of operation, self or

ensemble. The Group Call override allows the 207 Teacher's Console output to dominate the closed circuit communications.

An output from the 206 ceramic mic is applied directly to the 206 power amplifier mic input terminals. In the 207, a dynamic mic output is applied to a mic pre-amp circuit which is applied directly to the 207 power amplifier mic input terminals.

NOTE: This operations description also applies to the Models 207V and 205V teacher's console.

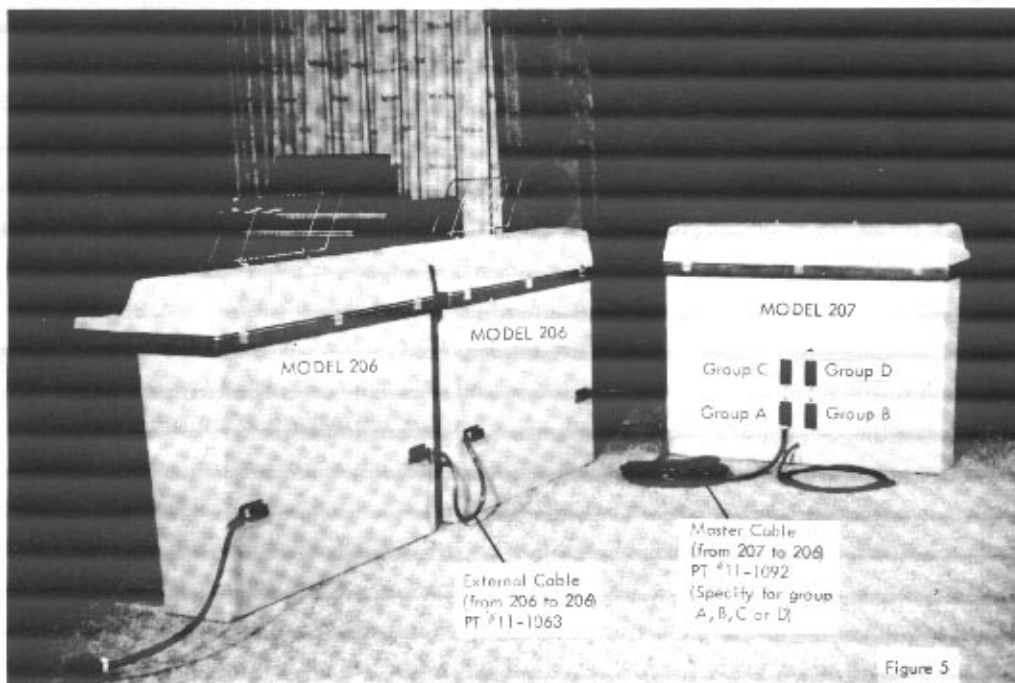


Figure 5

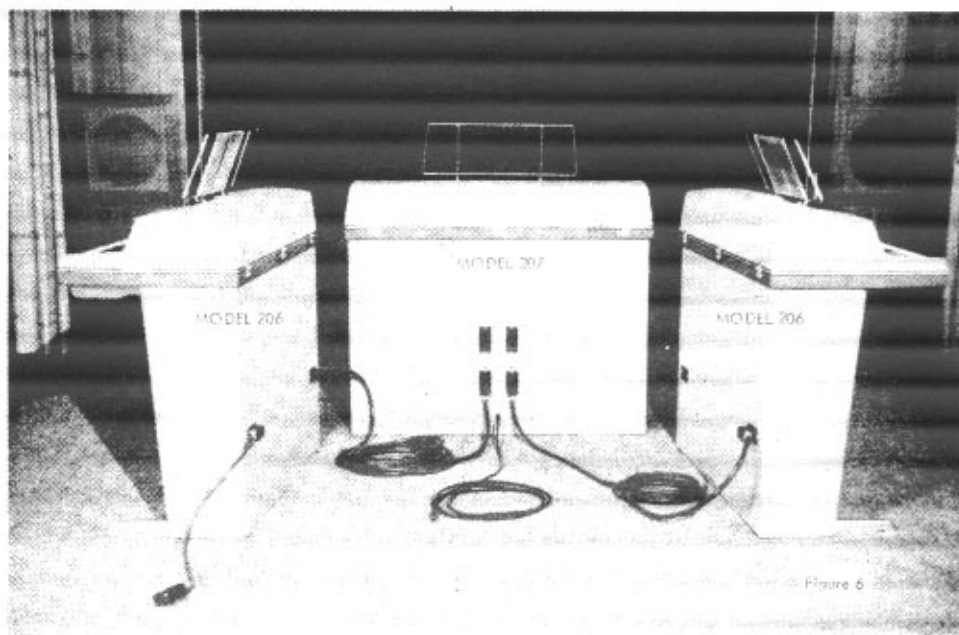
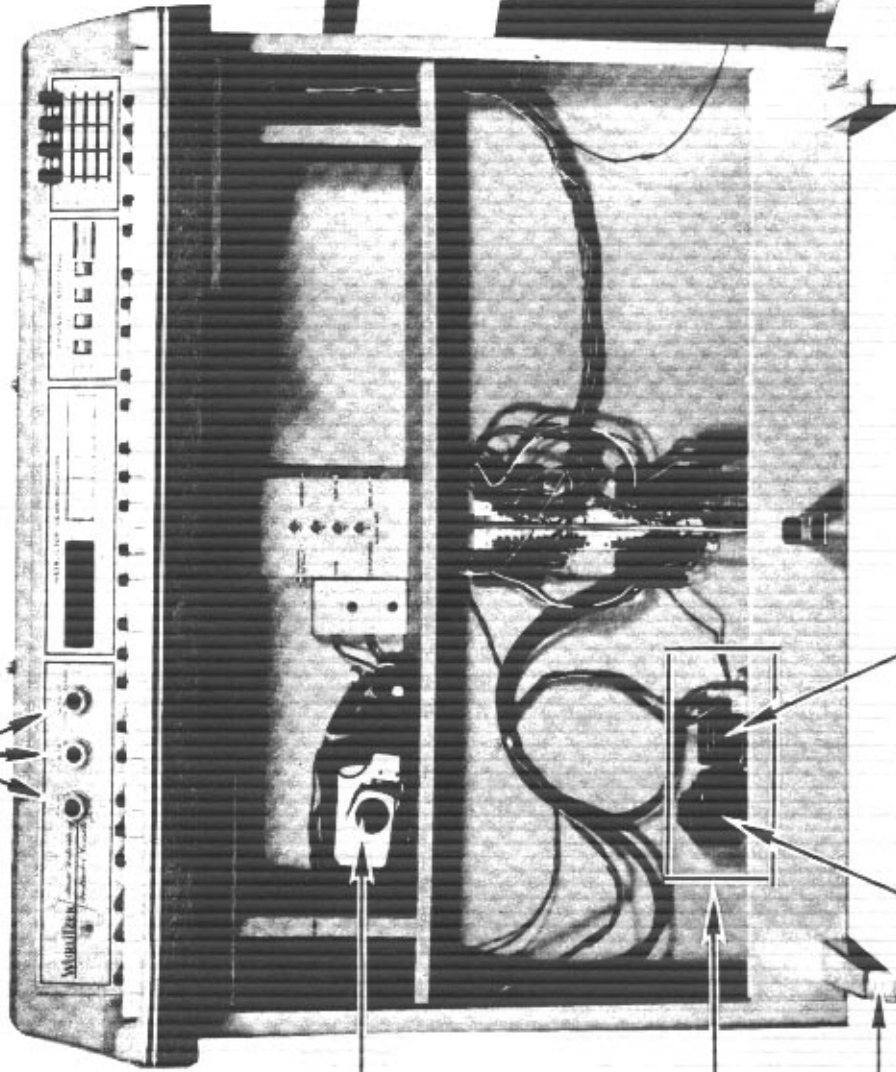


Figure 6

Knobs 207 (only)
Pt. #202140



Teacher's Headset
and Microphone.
Pt. #202181

Power Supply
Pt. #202158 (Fuses
under power supply).

Foot (Same on 206).
Pt. #202079

Power Transformer.
Pt. #201807

Communication Center
Power Transformer.
Pt. #202162

MODEL 207

2 8" Speakers.
Pt. #202172

FIGURE 7

The instructions in paragraphs three, four and five are for checking "A" group. They will also apply to groups "B", "C" and "D" in paragraphs eight thru fifteen.

To check a 207, at least two 206's are needed. (SEE FIG. 5 & 6, PAGE 24).

1. Connect groups to 207.
 - A) One group on connector "A".
 - B) One group on connector "B".
2. Start position.
 - A) **206**
 - a) Volume, maximum.
 - b) Self position. (Ensemble-self speaker sw)
 - B) **207**
 - a) Piano volume, maximum.
 - b) Mic volume, maximum.
 - c) Instruct switch (phone position).
 - d) Black tabs up.
 - e) White tabs up.
 - f) Red tab up.
 - g) Lighted tabs - yellow (center).
 - h) Audio Aids up (top).
3. First Check (Self)
 - A) **207**
 - a) Black tab "A" down.
 - b) White tab "1" down.
 - B) **206** - "A" group set to #1 position. (piano select switch).
 - C) Two-way communication should be heard.
 - D) Check remaining 207 piano tabs and student selector switch position (2 thru 6).
 - E) Two-way communication on all **like** settings. No communication on **unlike** settings.

NOTE: BAD COMMUNICATION ON "LIKE" SETTINGS

1. If the teacher cannot hear her 207, it has a wiring problem between the power amplifier and the headphone. (Refer to Schematic Part #11-1137) (202822)
2. If the student cannot hear his own 206, it has a wiring problem between the power amplifier and the headphone. (Refer to Schematic Part #11-0783A) (202821)
3. If the students and teacher can hear their own piano but cannot hear each other, there is a wiring problem between the 207 switching and the 206 switching.

COMMUNICATION ON "UNLIKE" SETTINGS

1. This is commonly called "cross talk". This can be caused by improper or no audio ground anywhere in the system. Check piano select switch (SEE FIG. 8, PAGE 30) making sure it is selected to the respective piano. Check for shorted leads.

4. Second Check (Ensemble)

- A) **207**
 - a) Black tab "A" down.
 - b) White tabs up.
 - c) Lighted tab group "A" up (red).
- B) **206** - "A" Group.
 - a) Ensemble position (self-speaker switch)
 - b) Slowly rotate piano select switch from #6 thru #1 position.
 - c) Two-way communication should be heard on all positions.

NOTE: 2A

If the teacher cannot hear her piano, there is a problem between her power amplifier and her headphone amplifier or between her headphone and the associated amplifier (TR-2, TR-3 Schematic Part #11-1139) (202520), which could also be defective. If the teacher cannot hear the student, the problem lies between the student's piano and its associated switching and the teacher's console and its switching mechanism.

If the teacher can hear the student's piano but the student cannot here his own piano or the teacher's, the problem lies in the teacher's switching or the associated Group ensemble amplifiers and/or headphone amplifiers located on the communication center circuit board.

- C) **207**
 - a) Red tab down. (Group Call)
 - b) Very little or no communication from 206 to 207.
 - c) Communication from 207 to 206.

NOTE: 2B

A malfunction found in this check indicates the problem lies in the vicinity of the "group-call" switch. Check TR-4 thru TR-10.

5. Third Check (Ensemble-Mix)

- A) **207**
 - a) Black tab "A" down.
 - b) Lighted tab group "A" down (green).
 - c) Lighted tab group "B" down (green).

- B) **206** (Ensemble Self-speaker sw)
- Group "A" piano in ensemble position.
 - Group "B" piano in ensemble position.
 - Play on piano group "A".
 - Listen to piano group "B".
 - Piano "A" should be heard in "B's" headphones.

NOTE: 3

If piano "A" cannot be heard in "B's" headphone, the lighted ensemble select switch "A" or "B" has misaligned contact, or a jumper wire connecting the two switches has a bad connection. This is assuming that the piano in group "B" has no malfunctions.

- Change cable from 207 receptacle "A" to receptacle "C".
- Repeat Steps 2 thru 5. Use corresponding Groups B-C.
- Change cable from 207 receptacle "B" to receptacle "D". Repeat Steps 2 thru 5. Use corresponding Groups C-D.

NOTE: Refer to comments on third check, paragraph 5. Repeat Steps 2 thru 4. Use corresponding Group D.

- Check (Audio Aid) 207. (SEE FIG. 9, PAGE 31).
 - Black tab "D" up.
 - Black tab "A" down.
 - White tab "1" down.
 - Audio Aid lever group "A" to position #1.
 - Audio Aid (tape player, radio, sig. generator, etc.) connected to Audio Aid #1 jack.
 - Audio Aid should be heard in teacher's phones.
 - Black tab "A" up.
 - Black tab "B" down.
 - Audio Aid lever "B" to position #1.
 - Audio Aid lever group "A" off.
 - Audio Aid should be heard in teacher's phone.
 - Repeat for "C" and "D".
 - Repeat for Audio Aid 2 thru 4.

NOTE: If an audio aid cannot be heard by the teacher in any of the positions stated above, the trouble will lie in either the audio aid jack or between this and the lighted switches.

MISCELLANEOUS

The 36 conductor plug at the treble end of the chassis on the Model 207 should be carefully checked and cleaned, inspected for broken or shorted wires, and be sure it is well seated and locked in position.

Make sure all external cable heads are well seated in their receptacles.

If a lab has all ensembles and audio aids inoperative, check the communication center power supply for proper voltages, located on bottom of piano.

Some Model 207's have 6.3 volts on the indicator lamps while others have 4.8 volts. A resistor 2.2 ohm 2 watt was added to drop the voltage from 6.3V to 4.8V, which gives added life to bulb.

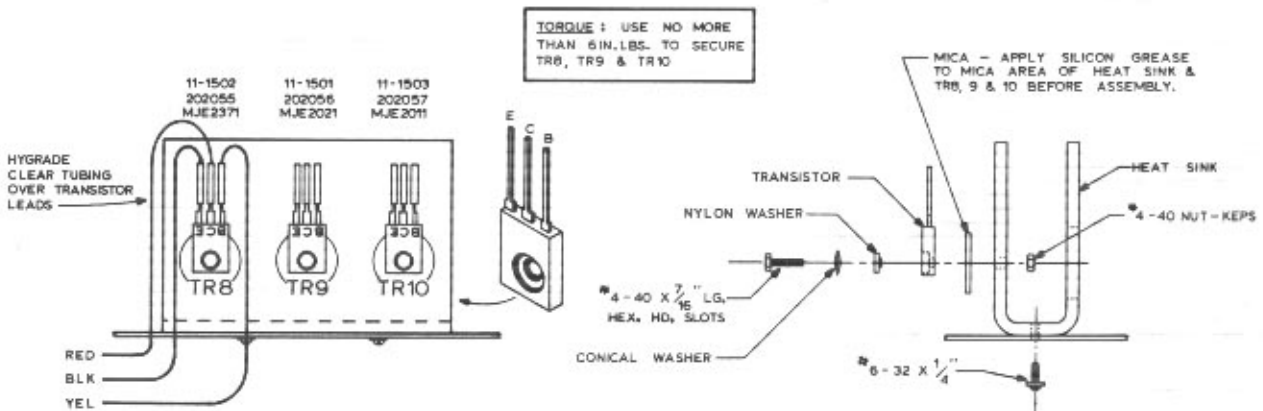
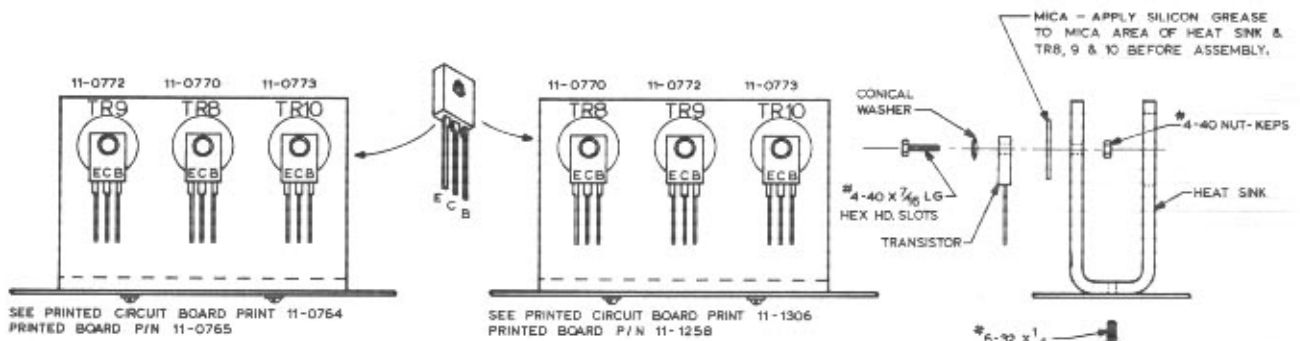
REPLACING PLASTIC POWER TRANSISTORS

- Remove defective transistor.
- Clean off old compound with solvent from:
 - Screw,
 - Face of heat sink,
 - Transistor mounting hole in heat sink,
 - Be sure the heat sink has no burrs that could puncture the mica.
- Bend center lead of new transistor.
 - Use two (2) long nose pliers.
 - Grip transistor leads.
 - Bend center lead.
 - Grip center lead.
 - Bend center lead.
- Use new heat sink compound:
 - On face of heat sink,
 - On back (copper side) of new transistor.
- Using a **new** mica washer and a new conic washer, stack and secure parts as shown.
- Tighten screw with about six inch lbs. of torque (hand tight).
- Now solder leads to p.c. board.

YOU WILL NOTE THERE HAS BEEN A CHANGE OF PART NUMBERS AND TRANSISTORS WHICH MAY TEND TO BE CONFUSING UPON REPLACEMENT. BELOW IS A LISTING OF PARTS, PART NUMBERS AND THEIR REPLACEMENTS. IN ADDITION, PLEASE NOTE LOCATION OF TRANSISTORS BEFORE REPLACEMENT.

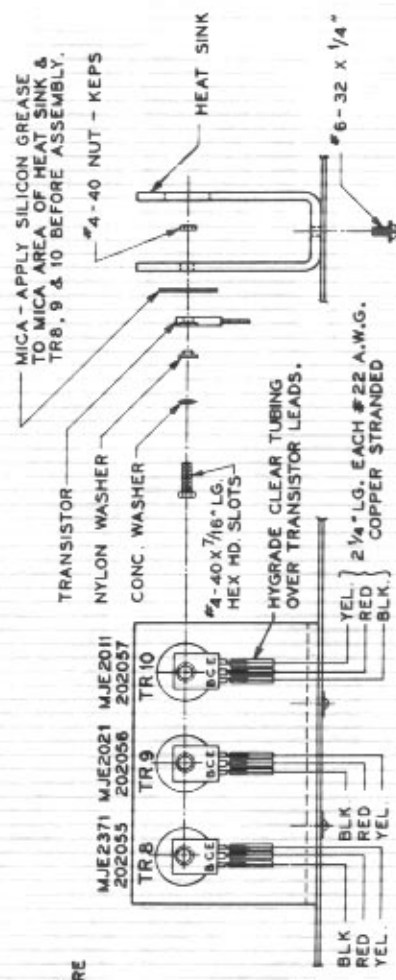
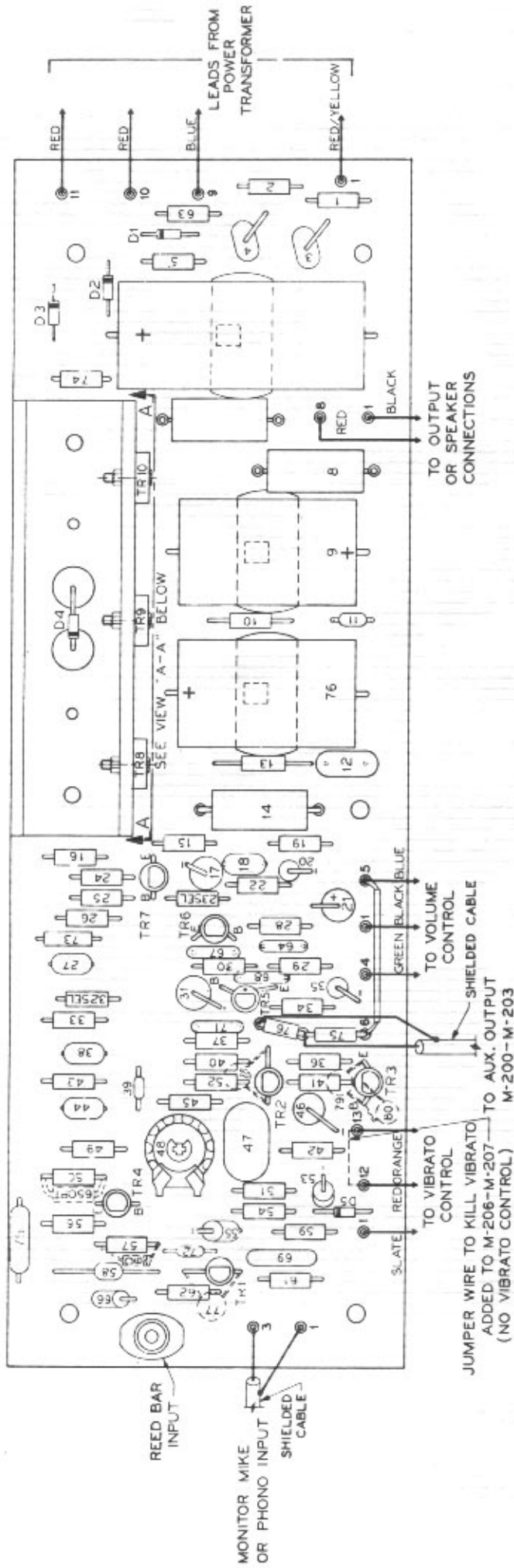
NEW PART NUMBERS MODEL & STARTING SERIAL NUMBERS	"OLD" PART NUMBER MODEL & STARTING SERIAL NUMBERS	MANUFACTURER'S EQUIVALENT	"OLD PART NUMBERS MODELS AND APPROX. STARTING SERIAL NO.	MANUFACTURER'S EQUIVALENT
200-73257	200-58050		200-55900	
203-73414	203-56403		203-55256	
214-73397	203W-56491		206-56501	
	206-57144		207-54029	
	207-55921		214-57777	
	214-57776			
TR-1 202051	11-0778	2N2926	11-1667*	2N6008
TR-2 202052	11-0778	2N2926	11-1668*	2N5998
TR-3 202073	11-0778	2N2926	11-0778	2N2924
TR-4 202053	11-0775	2N5306	11-0775	2N5306
TR-5 202073	11-0778	2N2926	11-0778	2N2924
TR-6 202073	11-0778	2N2926	11-0778	2N2924
TR-7 202054	11-0774	2N3859A	11-0774	2N3859A
TR-8 202055	11-0770	2N4919	11-1502*	MJE2371
TR-9 202056	11-0772	2N5191	11-1501*	MJE2021
TR-10 202057	11-0773	2N5194	11-1503*	MJE2011
			(*CHANGED)	
ITEM	NEW PART NUMBERS			
D-1, D-2, D-3, D-4	202050	GE-A13, 1N4005		
D-5, D-6	202049	1N4148	11-1500 (11-0789)	
	11-0769	GE-A13, 1N4005	11-1500 (11-0789)	
	11-0771	GE-A13, 1N4005	11-1500 (11-0789)	
	11-0781	1N4148	11-0781	

SEE PAGE 37 FOR TRANSISTOR LEAD CONFIGURATION.



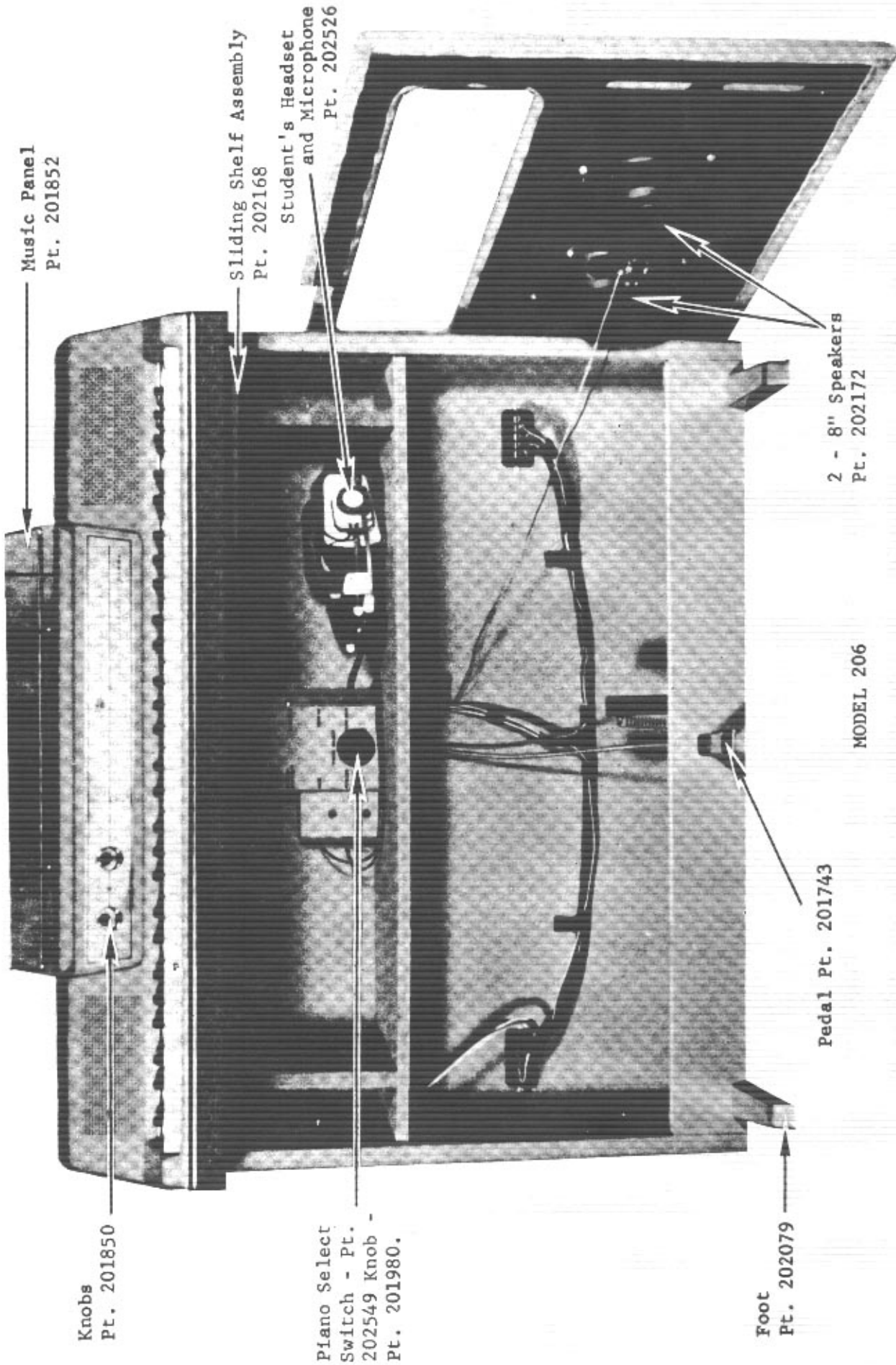
INSTRUCTIONS FOR CHANGING THE ELECTRONIC PIANO AMPLIFIER

THE PRINTED CIRCUIT BOARD DIAGRAM WILL HELP TO IDENTIFY COLOR CODING OF WIRES
THIS DIAGRAM WILL ALSO SERVE AS AN AID TO REPLACEMENT OF THE OUTPUT TRANSISTORS.



TORQUE - USE NO MORE THAN 6 IN. LBS. TO SECURE TR8, TR9 & TR10





Music Panel
Pt. 201852

Knobs
Pt. 201850

Sliding Shelf Assembly
Pt. 202168

Piano Select
Switch - Pt.
202549 Knob
Pt. 201980.

Student's Headset
and Microphone
Pt. 202526

2 - 8" Speakers
Pt. 202172

Pedal Pt. 201743

Foot
Pt. 202079

MODEL 206

FIGURE 8

To service Communication Center PC Board remove the screws at arrows and hinge back as shown.

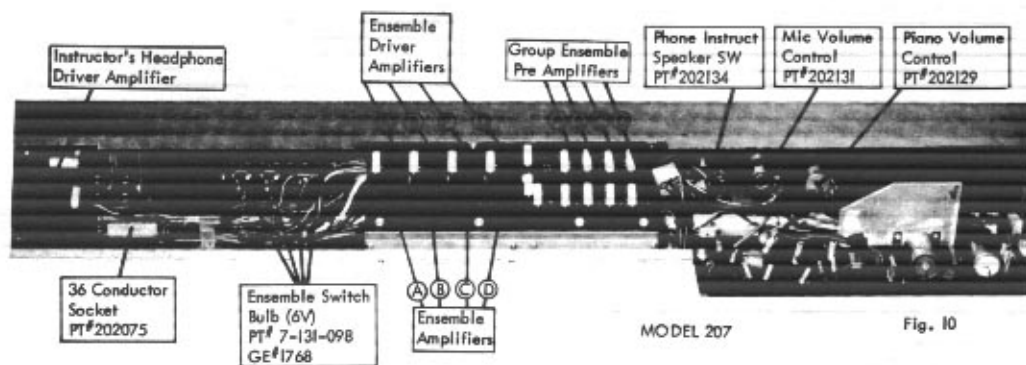
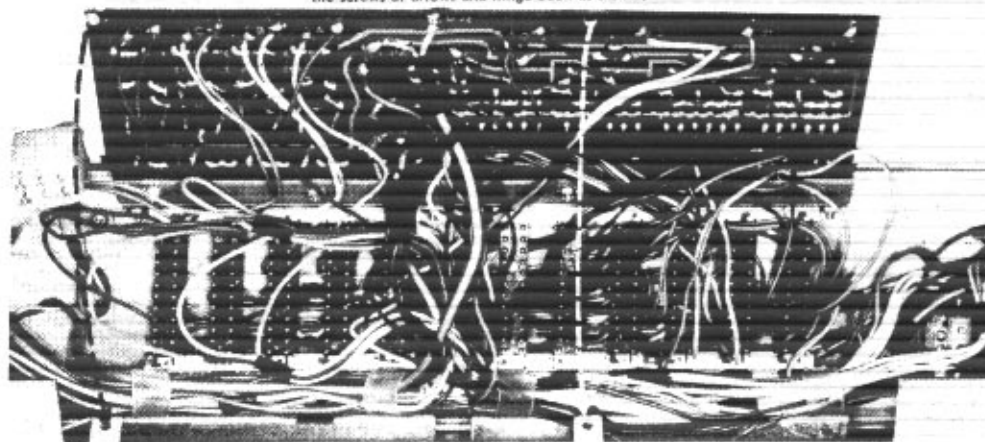


Fig. 10

TROUBLE SHOOTING CHART

Following is a complete check out procedure with trouble shooting hints.

NOTE: Useful service tools for making these checks are:

1. A 2000 ohm headphone with a 5 MFD, 35 volt (or greater) capacitor in series for D.C. blocking.
2. A small tape recorder with programmed music or a small transistor radio. These should have an appropriate patch cord to connect the tape recorder or radio in a phone jack or phono jack.

The headphone assembly will be used as a signal tracer. The tape recorder or radio will be a second "helper" providing an audio signal from a second piano. The signal from the sound source will be inserted into the microphone input. This will simulate a person playing the piano for signal tracing purposes.

For trouble shooting of 207 teacher's lab console and 206 student pianos, see 207 check out procedures starting on Page 26.

NOTE: The following complaints could happen on all six models. These are followed by a section strictly applicable to 206's and a 207 in a lab installation.

Complaint: Piano Dead - No Sound.

Make sure AC power is available at wall outlet.

- Cause:** 1. No AC power (Pilot light will not light).
- Correction:** 1.1 Check wall outlet for 120 V.A.C.
 1.2 Check the line fuse in the piano.
 1.3 Defective line cord and/or connectors.

- Cause:** 2. Defective transistor.
- Correction:** 2.1 Check all transistor voltages (collector-base-emitter).

- Cause:** 3. Shorted filter or open diodes in power supply.
- Correction:** 3.1 Check for low voltage and high voltage and replace shorted filter.

- 3.2 Check diode for resistive front to back ratio.

- Cause:** 4. Cracked printed circuit.
- Correction:** 4.1 Solder cracks in printed circuit.

- Cause:** 5. Defective transformer.
- Correction:** 5.1 Replace transformer.

- Cause:** 6. Reed shorted against pickup.
- Correction:** 6.1 With volume turned down, strike all keys several times with palm of hand. This will shake loose any foreign matter between the reed and the pick-up. Check to be sure reeds are centered in pick-up slots.

- Cause:** 7. Input Transistor (shorted or open).
- Correction:** 7.1 Replace TR-1.

Complaint: Distorted Tone.

- Symptom:** Raspy or harsh tone.
- Cause:** 1. Blown fuse on printed circuit board.
- Correction:** 1.1 Replace only the blown fuse on the circuit board with a short piece of wire. (Fuse has been eliminated on later models).

- Cause:** 2. Voltage regulation bad (higher or lower than 15.5 volts \pm 10%)
- Correction:** 2.1 Replace TR-5 and/or TR-6 (voltage regulator transistors).

- Cause:** 3. Final transistors (#11-0772, 11-0773) (202056, 202057) and driver transistor (#11-0770) (202055) defective.
- Correction:** 3.1 Replace all three transistors and check D-4 and R-10. Replace if defective.

Note: After removing all three transistors from the P.C. board and heat sink, follow procedure found on Pages 27 and 28.

- Cause:** 4. Weak input transistor TR-1 (#11-0778, green or yellow dot only) (202051)
- Correction:** 4.1 Replace TR-1.

Complaint: Excessive "Hiss" in Amplifier.

- Cause:** 1. Voltage regulator oscillating.
- Correction:** 1.1 Place a .01 MFD. capacitor from the collector of TR-5 to ground.

- Cause: 2. Transistor TR-2 and TR-3 noisy.
 Correction: 2.1 Change capacitor #18 which is a .1 MFD.
- Cause: 3. Transistor TR-1 noisy.
 Correction: 3.1 Place a 470 PF capacitor from the base to the collector of TR-1.

Complaint: R. F. Interference (Radio, T.V., Etc.)

- Correction: 1. Place a 750 PFD capacitor from the base of TR-1 to ground.
 2. Place a 750 PFD capacitor from the base of TR-2 to ground.
 3. Place a 750 PFD capacitor from the base of TR-3 to ground.
 4. Make sure all grounds and shielded cables are properly connected.

Complaint: Excessive Hum or Buzz.

- Cause: 1. Reed bar input cable not fully inserted into socket on P.C. board.

Correction: 1.1 Insert plug fully.

- Cause: 2. A.C. power wires too close to amplifier input.

Correction: 2.1 Redress A.C. cabling for minimum A.C. hum.

- Cause: 3. Filter capacitor in both low voltage and polarizing voltage power supplies broken loose from printed circuit board through vibration.

Correction: 3.1 Resolder joints and/or cracked printed circuit.

- Cause: 4. Neon pilot light wires dressed too close to input of amplifier or volume control wires.

Correction: 4.1 Redress all cables or wires away from pilot light assembly.

- Cause: 5. Light dimmer control in a room can cause noise in A.C. power lines.

Correction: 5.1 Turn lights to full brightness. Put a .01 MFD. bypass capacitor rated at 3000 volts between the ground post of the A.C. line and either one of the two 'hot' leads. One side will increase the hum, the other will remove it.

Complaint: Excessive Hum That Normal Grounding Does Not Eliminate.

- Cause: 1. Some water pipe and electrical grounds are located so far from the actual grounding point, they end up

being above ground electrically, and lose their effectiveness.

Correction: 1.1 Find a suitable ground as near the installation as possible and connect the lab ground system to it.

Complaint: Vibrato "On" All the Time When Piano is Turned On.

- Symptom: 1. Vibrato on a Model 206 or 207 (no vibrato normally on these two models).
 2. On all models, if vibrato cannot be turned off.

- Cause: 1. Shorting wire from pin #1 and #12 on printed circuit board improperly soldered or missing (206 and 207 only).

Correction: 1.1 Properly solder or add a jumper wire from pin #1 to pin #12 on the printed circuit board.

- Cause: 2. Voltage regulator oscillating and going out of regulation in time with the vibrato oscillator.

Correction: 2.1 Add a .01 MFD. capacitor from the collector of TR-5 to ground.

Complaint: Keys "Clicking".

- Cause: 1. Back of the sharp caps hitting the aluminum strip behind them.

Correction: 1.1 Remove the top and unscrew the two hex headed bolts that receive the music panel screws one or two turns. Be sure to tighten lock nuts after adjusting.

Complaint: "Cross Talk" in Lab.

- Cause: 1. This can be caused by improper or no audio ground anywhere in the system.

Correction: 1.1 Correct faulty audio ground.

Complaint: A Squeak When the Sustain Pedal is Used.

Correction: Place a small amount of thin grease or "Lubriplate" at the point where the bottom of the damper connecting rod passes through the felt washer and rubber grommet.

Complaint: A "Click" or Noticeable "Snap" When the Sustain Pedal is Depressed.

Correction: Squeeze the equivalent of four or five drops of an adhesive sealer such as Dow Corning's Clear Seal, or a white bathtub calking compound into the hole on top of the sustain pedal where the cable enters. (Allow three (3) hours to dry before using.) This material never hardens but gets rubbery and acts as a cushion or gasket for the steel ball on the end of the cable. The material is available at most hardware stores.

Complaint: Sticky Keys or Sluggish Action.

Correction: Refer to page 2, "Preparation of the Piano for Servicing" for information on how to dismantle the piano, and following this, it describes **easing keys and shrinking action centers.**

Complaint: One or More Notes That Are Extra Loud or Harsh.

Correction: Check to see if the reed involved is slightly off center in the pickup or electrode. If so, loosen the reed mounting screw, center reed, and retighten screw.

If the reed is centered and still too loud, bend the ends of the pickup up slightly (1/32" to 1/16"). (Do not bend the reeds, this makes them go flat in pitch).

Complaint: "Duds" or Reeds that Ring A Very Short Time and "Die Out".

Correction: This can generally be corrected, or at least helped, by loosening (one at a time) the four screws that mount the reed bar to the action brackets. If it can be determined which screw, when loosened, helped the most, remove the screw and place a paper front rail punching .010" to .025" thick under the reed bar at that hole and put the screw back in and tighten. It is generally a very slight twist to the reed bar when fully tightened down that causes "short ringers" or "duds".

Troubleshooting the Wurlitzer 200 Series Amplifiers

This text is directly taken from the Wurlitzer 200 Service Manual notes.

Electronic Piano Note #23

April 15th, 1971

200 Series Amplifiers

1.	Dead Amplifier (Pilot light does not light)	A
2.	Blows line fuse	B, C, D
3.	Blows output transistors	J, L, M, N, O, P - See Note #1
4.	Distortion	D, E, S
5.	Low Volume	E, S
6.	Static	E, F, H, I, J, K, T
7.	Hiss and noise (can control with volume control)	E, F, H, I, J, K, T
8.	Hiss & noise (cannot control with volume control)	C, I, J, K, U
9.	Hum	C, E, F
10.	Tremelo dead	Q, R

- A. AC line fuse open
- B. Shorted rectifiers D-2, D-3
- C. C-6
- D. Shorted output transistors
- E. Cracks or poor solder joints on PC board
- F. Poor ground on input cable
- G. TR-1 (use GE style 11-0778 or 651891 yellow or green)
- H. R-40, R-36, R-45, R-66 (replace with deposited carbon)
- I. R-14, R-7, R-8
- J. C-9
- K. C-18 too close to R-14
- L. R-14 (noisy)
- M. R-10 high in value
- N. D-4
- O. Burr on heat sink puncturing mica washer
- P. Use one mica under output and driver transistors with heat sink compound on both sides
- Q. TR-4
- R. C-53, C-46, D-5
- S. Open or shorted coupling capacitors
- T. Reed striking pickup
- U. TR-5, TR-6

Note #1. Inspect C, J, L and follow P prior to turning piano on after replacement of output TR'S.

ELECTRONIC PIANO 200A

Before ordering a new AC power cord for a model 200A, check to see which type of pins is used in the receptacle of your piano. Recently, a new connector has been introduced which features rectangular shaped pins rather than the traditional, round ones. Including the description "round pins" or "square pins" on your parts order will insure the proper type of cord to be sent.

Model: 200, 203, 206, 207

Subject: Failure Output Transistors

References: Schematic - Piano Amplifier (11-0783)

When called upon to change output transistors in the Electronic Piano, check the following items to ensure they are in good functioning order. Check for the following:

C-6	1000 mfd.	50 VDC	Intermittent
C-9	500 mfd.	50 VDC	Intermittent
R-14	200 mfd.	5 watt resistor	Noise
R-8	.68 ohms	5 watt resistor	Noise
R-7	200 ohms	5 watt resistor	Noise
R-10	2.7 ohms	1 watt resistor	Open

MODEL: 200 Series Electronic Pianos

Subject: Connecting external amplifiers

Reference: 200 Series amplifier Schematic No. 11-1305-S-1

The most satisfactory point to obtain a signal for driving an external amplifier is at the auxiliary output jack. As the piano is wired, this signal is taken from point 7 (signal) and point 1 (ground). It has been noted that in some cases this circuit does not supply sufficient drive signal to the external amplifier input. In other cases a hum is introduced into the external amplifier. The following circuit has been found to correct these conditions. Change the 100K resistor between points 6 and 7 to a 6.8K and the 15K resistor between points 1 and 7 to a 2.2K. The maximum signal is approximately .5 volts peak to peak. If there is no D.C. voltage at the external amplifier input, a cleaner drive signal can be obtained by removing the 5MFD capacitor between pins 5 and 6 and replacing it with a jumper wire.

Model: 203-203W, 214

Subject: Baffle Board Wiring

If you should encounter a piano which has apparent low volume, check speaker wiring to ensure they are all in phase. The orange wires should be connected to the speaker terminal with the color dot. The black wires to the unmarked speaker terminals.

The 200 series seems to be the most popular model amongst collectors and players alike. It's the latest of the reed-based pianos, the lightest in weight, and probably has the best action and sound amplification of all the models. I won't dwell on this aspect much, since it's merely opinion.

According to the schematic dates of the 200 series, they were being made in 1981 (200-B) and beyond. Below is an excerpt transcribed from the original manual.

MODEL 200, **200A** (PROFESSIONAL PORTABLE)

	64 Notes, A-13 thru C-76
<i>(From Floor to Keys With Legs)</i>	28 5/8"
<i>(Less Legs)</i>	7 1/8"
<i>(From Floor to Top of Case, Not including Music Panel)</i>	33"
	40"
	18 9/16"
<i>(Less Legs and Pedal)</i>	56 lbs.
	Removable chrome plated steel legs, two of which have leveling glides.

MODELS 203, 203W, **206**, 207, 207V, 214, 214V, 215V & 270

The Models 203 and 203W are home consoles. For Group Piano Instruction, the Model 206 is the student console and the Models 205V, 207 and 207V are teacher's consoles. The Models 214, 214V and 215V are classroom consoles. The Models 207V and 214V have the switches, wiring and plugs installed for use with the Model 208 Key/Note Visualizer. The Models 205V and 215V are similarly equipped to operate the V-500 key/Note Visualizer. The Model 270 is a Butterfly grand using similar internal assemblies as the model 200.

	64 Notes, A-13 thru C-76
<i>(From Floor to Top of Keys)</i>	28 5/8"
<i>(From Floor to Top of Keys) Model 270</i>	27 1/4"
<i>(Not including Music Panel or Casters)</i>	32 7/8"
<i>(Not including Music Panel) Model 270</i>	34"
	40"
Model 270	41"
	18 9/16"
Model 270	37 1/2"
Model 270	Approx. 150 lbs.

<i>(With Legs and Lyre)</i> Model 270	160 lbs.
--	----------

- **Wood Bench with removable chrome plated steel legs, two of which have leveling glides.**
- **Sugar Pine keyboard, naturals are covered with white implex plastic, sharp tops are black molded plastic.**
- **Wurlitzer manufactured action, employing conventional action parts such as whips, butts, flies (jacks), dampers, etc. Regulates Like a Conventional Piano Action.**
- **Three ply maple covered with mothproofed felt.**
- **Hammers strike steel tone producing elements, causing them to vibrate in a polarized electrostatic field.**

200	Two 4"x8" Oval (16 ohm)
203	Two 4"x8" oval plus two 8" round <i>or</i> four 8" round
203W	Four 8" round
205V	Two 8" round (8 ohm)
206 206A	Two 4"x8" oval (16 ohm) <i>or</i> two 8" round Two 8" (16 ohm)
207	One 6"x9" oval (8 ohm) <i>or</i> one 8" round (8 ohm) <i>or</i> two 8" round (8 ohm)
207V	Two 8" round (8 ohm)
214 214V	Four 8" round

Troubleshooting the Wurlitzer 200 Series Amplifiers

215V	
270	Two 8" round

Frequently Asked Questions

Question: I just bought a 200A from a music store and I was wondering how long Wurlitzer made them. I'm guessing roughly 1961-1970; is that close?

I'm still trying to find out exact dates of manufacture pertaining to model years, but it appears to me (all I have to go on right now are schematic dates) that the 200 series came out around 1967-68, the updated 200-A came out around 1972-73, and the 200-B around 1979-80.

Question: I was wondering where I can get the manual for the Wurlitzer 200a and the cost of it. Thanks.

Morelocks Organ Service has the real-deal manuals for ALL the Wurlitzer Electric Pianos. The 200 series manuals cost me \$18.00 plus actual shipping, and it covers all the 200 series models.

Question: Is there a Wurlitzer 200 and 200-A, or is it normally referred to as the 200?

Yes, there is indeed a 200 AND a 200-A, as well as a 200-B! These models have IDENTICAL actions, cases, legs, sustain pedal, etc. The difference is in the Amplifier. The 200 series has a transistor amplifier, and the 200-A has an updated transistor amplifier. To my ears, I cannot tell the difference in tone between the 200 and the 200-A. I'm told the reason the amps were updated was because the price of NPN-type transistors were less than the PNP-types that were originally used in the original 200. The 200-B actually has an IC-based pre-amp designed to be used for external sound systems, leaving out the internal amplifier that drives the speakers.

Question: I am looking for someone who really knows how to work on this particular model. Over the years I've had more than a few people work on it and it never has sounded right. Any info that you could share with me would be extremely helpful.

Good keyboard techs are the hardest thing to find in the world! What I would recommend doing is buying the service manual for your particular model, then seek out a qualified piano tech in your area. The actions inside the Wurlitzer Electric Pianos are VERY much like the actions in an acoustic piano, therefore a piano tech should have no trouble setting up the action. As for the electronics, the amplifiers are pretty straight-forward, so a good electronics tech should be able to troubleshoot them with the proper schematics. Most music stores have a guy that can do all these things, and I'm going to put together a list of techs that work on these pianos as well. I would recommend looking [HERE](#) for places and numbers.

Question: I need a new power cord for my Wurlitzer electric piano, model 200, and I was hoping that maybe you could steer me to where I could get a replacement.

ALL parts are available at Morelocks Organ Service. I have their information, as well as other places to buy parts and manuals [HERE](#).

Question: I've tried to no avail to find info on Wurlitzer organs or the Wurlitzer Company. If you can point me to any relevant sites or provide any info it would be greatly appreciated.

I get LOTS of E-mail on this subject! No offense, but I DON'T do organs! But seriously folks, here's some links i've found on that subject.

- [Mitatechs](#) *This is a HUGE site. One could get lost here for a long time! Look here for every bit of info anyone could conceive pertaining to Organs.*
- [Baldwin](#) *This famous Piano manufacturer bought Wurlitzer back in 1988, and they have all the info for the acoustic pianos division of Wurlitzer.*

Question: I have a model 200 (I think) which buzzes quite loudly. I was informed that it was because the ground was not connected. I attached an entirely new power cable and yet the buzz persists. how do I make it quiet?

The first thing to check is all the grounds INSIDE the piano. Many times, these pianos are serviced, and an internal ground was left off or loosely attached. I'll be posting an entire [Troubleshooting](#) section very soon.

Question: The wurly sound that I really enjoy is the one used by supertramp. Do you know which model do they (supertramp) use?

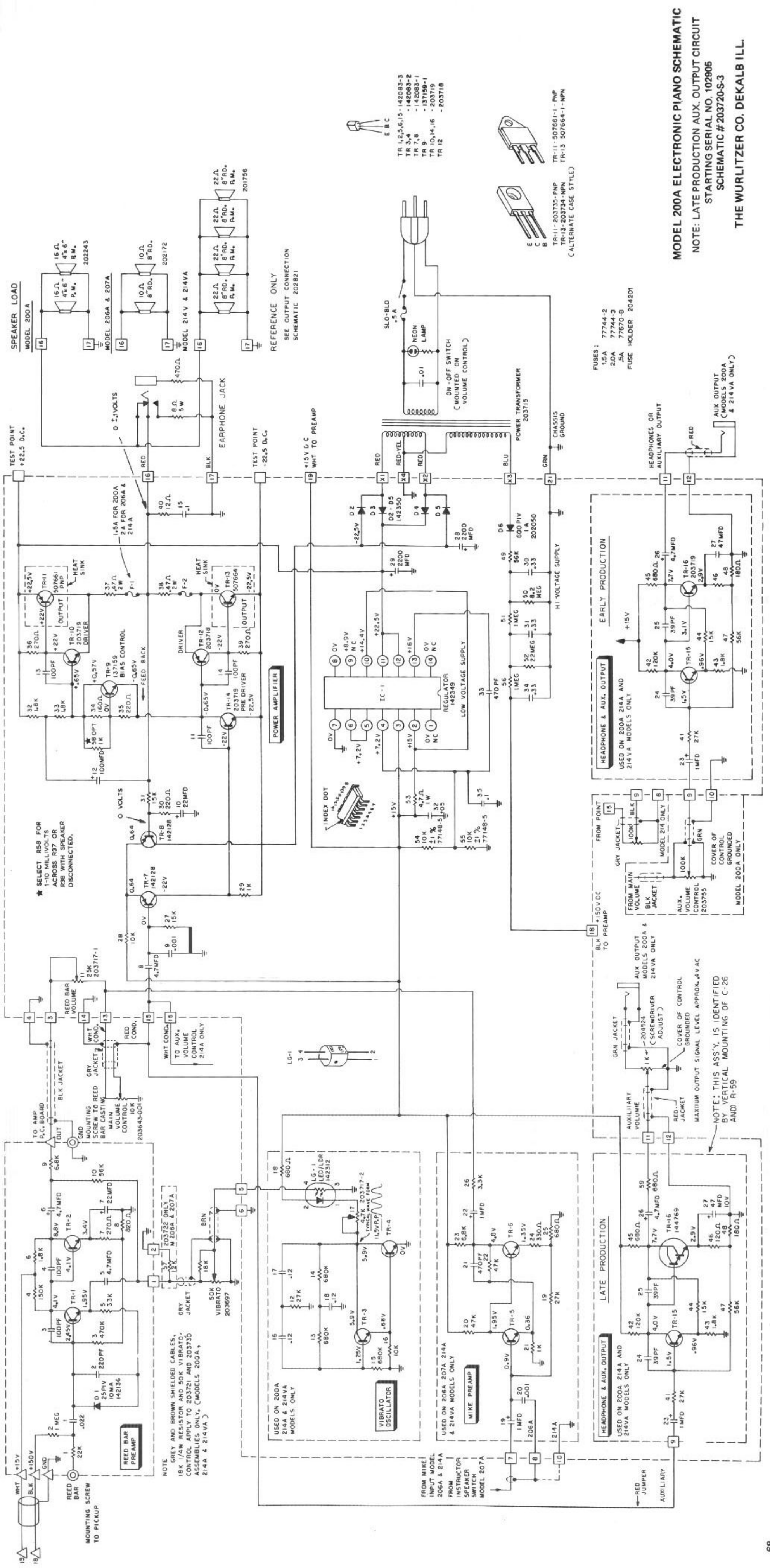
I BELIEVE that supertramp used a 200A for all their recordings. They also doctored up the sound using compression, chorusing, reverb, etc. I'm currently researching this subject.

Question: I've seen some models selling on the ebay, for example: There is an EP200A in auction that has a broken middle C reed and has no sustain pedal. Is the broken reed a bad sign? Can the piano be in a bad shape, from an internal point of view, or a broken reed is somehow usual?

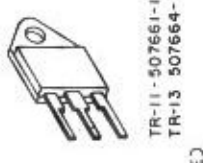
The reeds can be broken rather easily...this is a common problem. I wouldn't worry about it too much, since it happens fairly often, especially with players that like to hit hard to get that "barking" tone that rockers like so well!

Can it be easily replaced, is it expensive?

Yes, they can be replaced pretty easily, and the parts are available and fairly inexpensive. Once again, click [HERE](#) to gets parts information.



- TR 1,2,3,6,15 - 142083-3
 TR 3,4 - 142083-2
 TR 7,8 - 142083-1
 TR 9 - 137159-1
 TR 10,14,16 - 203719
 TR 12 - 203718

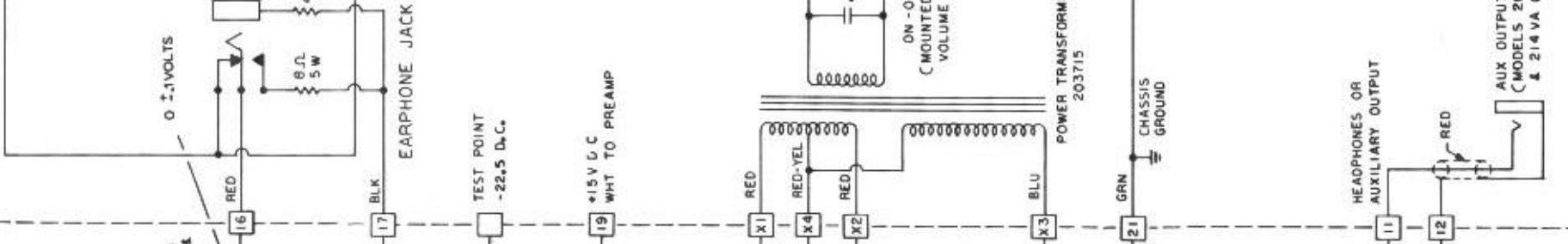


MODEL 200A ELECTRONIC PIANO SCHEMATIC
 NOTE: LATE PRODUCTION AUX. OUTPUT CIRCUIT
 STARTING SERIAL NO. 102905
 SCHEMATIC # 203720-S-3

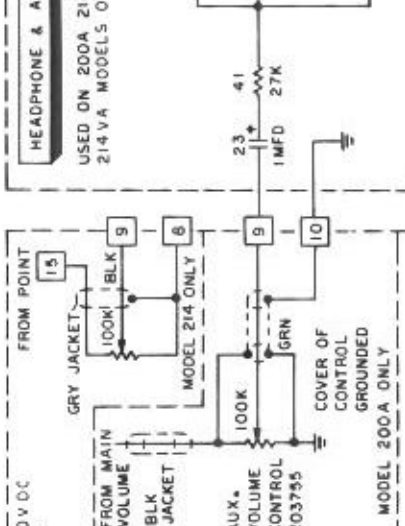
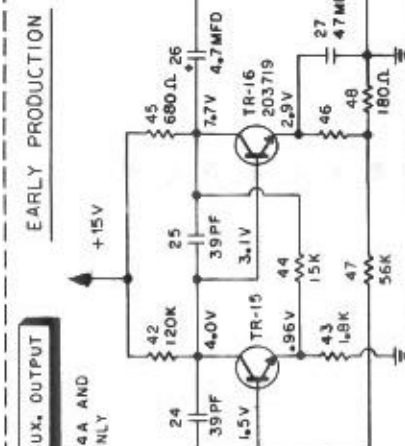
THE WURLITZER CO. DEKALB ILL.

REFERENCE ONLY
 SEE OUTPUT CONNECTION
 SCHEMATIC 20282!

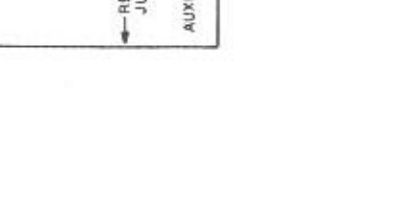
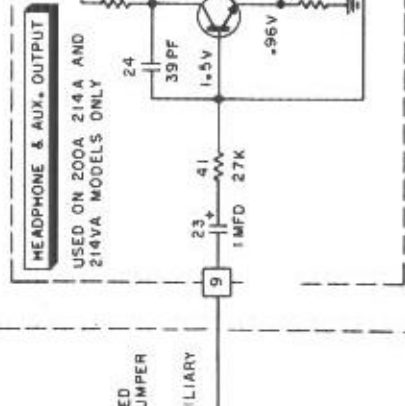
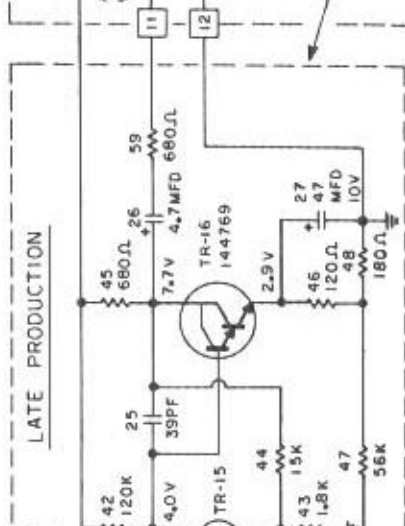
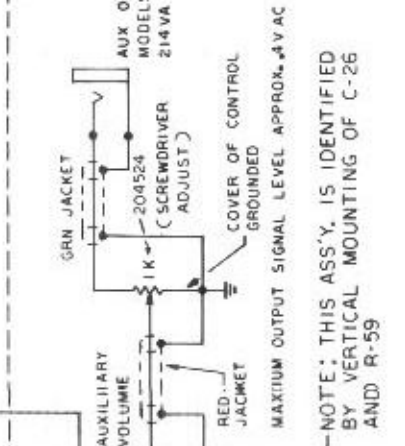
- FUSES:**
 1.5A 77744-2
 2.0A 77744-3
 5A 77670-B
 FUSE HOLDER 204201



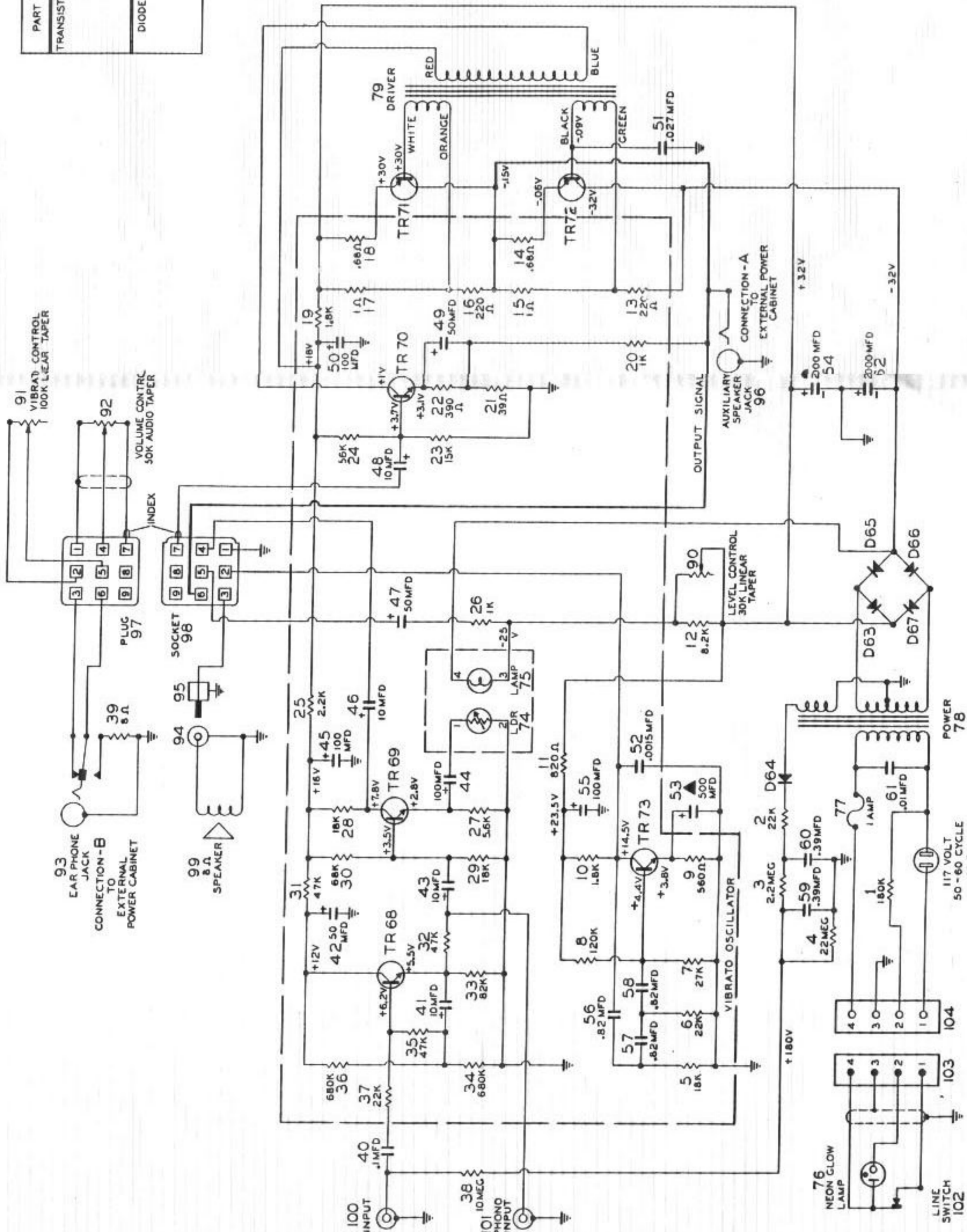
★ SELECT R58 FOR 1-10 MILLIVOLTS ACROSS R37 OR R38 WITH SPEAKER DISCONNECTED.



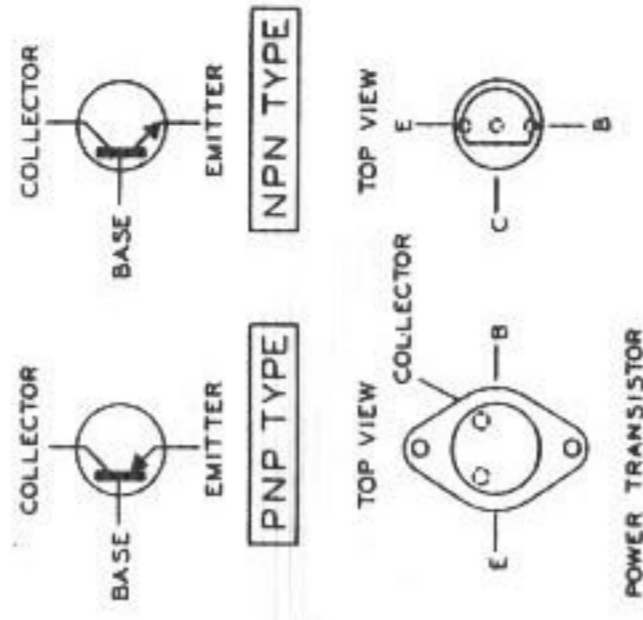
NOTE: THIS ASS'Y. IS IDENTIFIED BY VERTICAL MOUNTING OF C-26 AND R-59



SCHEMATIC - ELECTRONIC PIANO - MODEL 140B



PART	NUMBER	WURLITZER PART NUMBER
TRANSISTOR	TR68	11-0422
	TR69	11-0422
	TR70	11-0422
	TR71	11-0399
	TR72	11-0399
DIODE	D63	11-0429
	D64	11-0430
	D65	11-0429
	D66	11-0429
	D67	11-0429



NOTE
 ALL DC VOLTAGES MEASURED WITH A VACUUM TUBE VOLTMETER TO CHASSIS GROUND. TOLERANCE ±10% EXCEPT AS NOTED. LINE VOLTAGE 117 VOLTS.

ALL ELECTRONIC COMPONENTS SUCH AS RESISTORS, CAPACITORS ETC. ARE IDENTIFIED WITH A NUMBER.
 EXAMPLE -- 41
 THE 41 IS THE IDENTIFICATION NUMBER.

NOTE
 COMPONENTS SHOWN WITHIN BROKEN LINE BORDER ARE LOCATED ON PRINTED CIRCUIT BOARD.

THE WURLITZER COMPANY - DEKALB DIVISION - DEKALB, ILLINOIS
 MODEL - 140B ELECTRONIC PIANO.
 TITLE - SCHEMATIC - ELECTRONIC PIANO - PART NO. 11-0547-S-4-E-1
 STARTING SERIAL NO. 29091
 DATE - JUNE 1, 1966