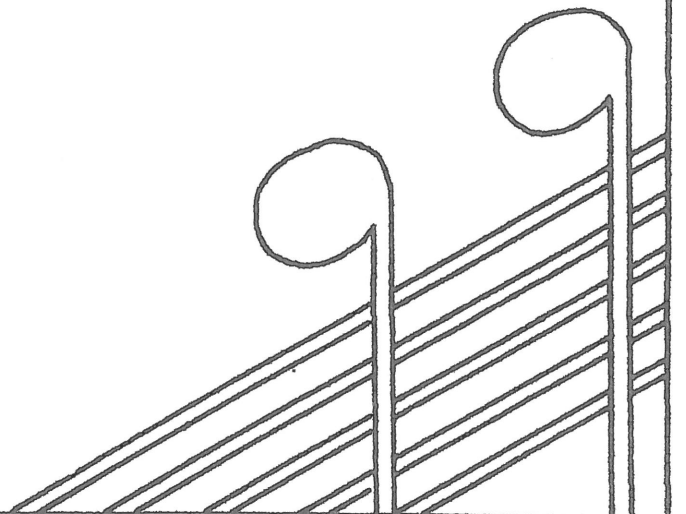
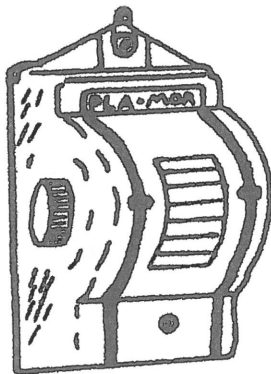


SERVICE MANUAL

HOMER E. CAPEHART'S

PLA-MOR

REMOTE CONTROL SYSTEMS



THE OPERATING AND MAINTENANCE PRINCIPLES OF THE PACKARD WALL BOX SYSTEM ARE BASICALLY SIMPLE, AND CAN BE UNDERSTOOD BY ANY SERVICE MAN, WHO WILL CAREFULLY READ AND UNDERSTAND THIS MANUAL.

NO INSTALLATION SHOULD BE MADE UNLESS THE SERVICEMAN HAS READ CAREFULLY ALL OF THE INSTRUCTIONS COVERING THE INSTALLATION OF THE ADAPTER EQUIPMENT, AND KNOWS HOW TO INSTALL THE WALL BOXES.

A LARGE PERCENTAGE OF WALL BOX TROUBLE DEVELOPS BECAUSE OF IMPROPER INSTALLATION BY INEXPERIENCED WORKMEN.

85% OF ALL TROUBLES ARE IN THE PHONOGRAPH MECHANISM, AND HAVE NO CONNECTION WITH THE WALL BOXES, SO DO NOT IMMEDIATELY BLAME THE REMOTE CONTROL EQUIPMENT FOR EVERY COMPLAINT. A THOROUGH UNDERSTANDING OF THE OPERATING PRINCIPLES OF THE PACKARD REMOTE CONTROL WALL BOX SYSTEM WILL GIVE THE SERVICEMAN A MENTAL PICTURE UPON WHICH HE CAN BASE HIS METHODS OF INSTALLATIONS AND ANALYSIS OF SERVICE TROUBLE.

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1. OPERATION OF WALL BOXES.

The cycle of operation, from the dropping of coin to actual playing of the record, follows, giving the function of mechanical parts, without attempting to point out service troubles.

An operating system consisting of a Packard Wall Box and adapter assembly, should be at hand to refer to, in order that the following description may be clearly understood.

Turn selector knob to No. 1 position. The numeral "1" should be directly to the right point of the left "selection" arrow. Remove the front housing on the wall box and the money pan.

The 5/16" shaft through the box carries the selector drum, attached to which is a self-wiping bronze contact switch.

Looking into the Wall Box mechanism to the left of drum assembly, you will notice the bronze self-wiping switch. The pointed end of this switch should be standing directly in the center of a brass screw rivet, passing through a bakelite plate, to which the proper colored wire for #1 selection is to be attached and directly under this screw should be figure #1. Now rotate this drum, you will notice contact switch travels to #2, 3, 4 and so on until you see this contact point is directly on each rivet so marked, according to the figures on this drum. The other end of this bronze self-wiping contact switch is wide and travels on a brass plate held in position through the bakelite and is your ground or common wire stud. When this bronze self-wiping contact switch is in position on any one of these screw rivets and a coin is dropped through the coin mechanism, it completes the circuit through the wide end of this wiping arm to the screw rivet on which the narrow end of this wiping arm is touching.

Looking again to the left of selection drum, notice a sprocket attached to this selector drum. Each of these spaces between two teeth on this sprocket correspond with a number on selector drum. Tip your box forward, look down on top and rear to back of the sprocket, you will notice program drum rotating ratchet arm. Now rotate your drum, notice a little roller on the ratchet arm moves down into position between two teeth on this sprocket holding the arm in position, ready to deposit coin.

Tip box backward, look to left and under selector drum. Notice drum locating ratchet arm attached with large brass screw to left-hand drum carrying bracket. A coil spring runs forward to stud in same drum carrying casting, which pulls the arm into position as drum is rotated. Notice locating arm is "V" shaped. Looking down again in top and over drum to the left - now rotate drum backward and forward - watch motion of your locating arm. Notice the back portion of this "V" type arm pushing against a copper piece of metal which is attached to slug-proof coin chute. This copper piece of metal being pushed by your drum locating ratchet arm prevents a coin going directly through coin mechanism into cash box at any time selector drum is being moved or at any time drum locating ratchet arm is not down in position between two teeth.

Lay wall box on it's back. Look down under drum and to right, you will notice a butterfly contact switch fastened to lower right-hand corner of National slug rejector coin mechanism. Notice on face of this coin mechanism near right-hand lower corner is riveted a spring with a little brass clip on the end. The purpose of this spring is to lock the little pan in position on the butterfly switch. Take your pencil - raise little spring up and down - this will give you an idea of how it performs. The little spring with lock clip on end is to prevent tripping butterfly switch by striking box on the top or bottom. The spring lock is released by a nickel on it's way to the switch - striking a little brass stud, which you will notice riveted through the spring just above locking clip, which forces the little spring outward unlatching pan on butterfly switch - permitting pan to press downward which in turn makes contact through butterfly switch contact points.

Set box upright, now drop coin - look under the drum. Watch action of this butterfly switch, as well as safety locking spring.

Notice butterfly switch has two spring steel contact plates. In lower end of each is riveted a silver plated contact button. These contact springs are carefully adjusted at the factory. Contact buttons facing one another should be 1/16" apart. Notice a short heavy steel plate to left of right-hand steel contact spring, mentioned herein. This piece of steel is your adjustment for your butterfly switch contact springs, which carry contact buttons. This steel plate should at all times be snug against right-hand contact spring. The purpose of this steel plate is to prevent making contact of the two contact buttons by striking box on right hand side. To adjust space between the two contact buttons - bend your steel plate outward to the right, if more space is needed between the buttons and of course, back to the left if less space is needed. Left contact spring should always be straight up and down as nearly as is possible. In other words, do not bend the inside contact spring. In bending these parts on your butterfly switch, always use a special tool or round nose pliers - never use your fingers as your contact springs will come back into position if not bent properly with metallic instruments.

When coin releases this butterfly switch lock, watch the movement of the little pan that the nickel strikes. Hold your pan up by hand with the nickel resting on it. Notice this little butterfly switch pan is goose-neck in shape, with a little contact button riveted on the end. Slowly lower this pan by hand - notice this little contact button pushes the inside contact spring to the right and outward until it has made a good, firm contact against the button carried by the right-hand spring contact button. This movement completes the circuit through the butterfly switch through the box selector switch to the adapter pin corresponding with the number selected on your box.

Looking on top of box, directly back of receptacle for coin, protruding upward, is a steel plunger. This plunger when pushed downward operates the bent coin or steel slug rejector on National slug rejector. This operation is purely mechanical. Push it down gently - watch the motion of your coin rejector.

2. SERVICING OF WALL BOX.

Because of the fact that a player drops his coin in the wall box and music fails to result, the wall box invariably is blamed, whereas from actual experience, we have found that 75% of all complaints of this type are due to something wrong at the phonograph proper, having no connection whatsoever with the wall box system.

It will also be found that the public requires a certain amount of education and experience in connection with wall boxes. For example, in many cases, due to the heavy play put on phonographs by wall box installations, there may be 10 or 12 records already selected which will come up in numerical rotation, and many times a patron will expect that his particular selection is going to come up as soon as the piece already playing is over, and will claim that he did not get his music.

ON EVERY SERVICE CALL, BE SURE TO FIND OUT FROM THE LOCATION EXACTLY WHAT HAPPENED TO CAUSE THE COMPLAINT. Ask enough questions to ascertain whether only one box does not work as it should, and whether this is on particular selections only, or on all.

If on all boxes, find out if it is only certain selections, or any selection.

If the trouble is of a spotty nature, occurring only during the extremely busy periods when the light lines are heavily loaded, before passing judgment, check the voltage AT THE PHONOGRAPH, and at the LAST WALL BOX at a correspondingly busy period.

If none of the wall boxes operate, it would naturally be assumed that the trouble can be located at the phonograph. The main phonograph fuse may be blown, or a fuse on the wall box adapter power panel.

The phonograph mechanism may be jammed.

For service notes on phonograph adapters, refer to the instruction booklet on that particular type of adapter.

If you have definitely determined that one box seems to be at fault, the following point should be considered.

3. IF WALL BOX FAILS TO SELECT.

Check the voltage at wall box in question with a good volt meter. The voltage should not be less than 24 volts. The line of voltage may be checked very easily by connecting the volt meter across your common and anyone of your selector wires. With proper installation of wiring, there should never be over two volts difference at any wall box and the phonograph. Now see that your butterfly switch is making proper contact. See that the contact points are clean. See if either wire running from butterfly switch to it's termination is broken or loosened. See that your common wire or ground wire, which is connected to the brass screw rivet in bakelite on the left-hand end of drum is properly connected. See that your slug rejector is not stopped up in any way - partially or wholly. See that the brass contact screw rivets through your bakelite are clean, as well as your bronze selector switch contacts. Always use carbon tetrachloride as a cleaner - apply it freely as no damage can result from applying it to any part of the wired mechanism.

If all numbers in an individual box refuse to play, your trouble could only possibly be from stopped up coin chute, bad adjustment on butterfly switch, broken wire at butterfly switch or broken ground wire. If only one number refuses to play on an individual box, your trouble should be located on the wire of that number at it's connection to the brass screw rivet on the bakelite terminal.

If all boxes refuse to play when coins are dropped, your trouble will be found in most instances, at the phonograph mechanism. Either your main motor fuse is blown or the fuse on your wall box selector circuit. Phonograph repeating on all numbers would indicate that a coin is sticking on the little pan which trips the butterfly switch. Adjust this trip so that a nickel coming to a dead stop on this little butterfly switch pan, makes a proper follow-up contact, when lowered slowly by hand. If the tension in this switch is too great to permit the nickel to go to the coin box, when being let down slowly by hand - adjust by bending with pliers the goose-neck end of this portion of the butterfly switch that the nickel pushes downward. If a nickel is laying on this switch, then rotating the drum would trip all numbers on the phonograph. If two or more numbers play on the deposit of one nickel without rotating the drum, there is only one trouble to look for - a short is in your multiple cable caused either by a nail being driven through the cable, a short bend injuring the installation and allowing wires to short through or some object getting across the brass screw rivet on your bakelite switch terminal.

4. INSTALLATION SUGGESTIONS.

THE PROPERLY WIRED wall box installation will be trouble-free.

There are a few very important points which must be kept in mind when wiring the location, which will eliminate practically all causes of wall box complaints. They are as follows:

1. The voltage on the boxes must be between $23\frac{1}{2}$ volts minimum and 25 volts maximum.

Don't put more than eight to ten boxes on one line, connecting to the phonograph.

Where there are more boxes than this number on a line, after each tenth box, run another feeder cable back to the phonograph, in order to effect uniform voltage throughout the system.

Always remember that if there are more than TWO volts difference between the phonograph and the farthest wall box, that either the lines are too long, or there are too many wall boxes on one line. The remedy is to run feeder lines back, as described above.

2. Mechanical damage is the most prevalent cause of trouble, and should be avoided along the following lines.

- a - Don't drive nails into the cable. This is a very common occurrence, and is generally caused when the cable is to be covered by a wooden moulding. In placing the moulding, be sure the nails do not turn inward towards the cable, which is concealed and pierce its covering, thereby shorting wires. THIS IS VERY IMPORTANT and when short circuits show up - look for a badly located nail.

- b - Don't crush the cable when holding it against a surface with insulating staples. Staples are to be driven down only tight enough to hold the cable in place, and should a staple be missed by the hammer and the cable hit instead, cut the cable covering and inspect at that point, to avoid future trouble.

- c - Don't pull the cable sharply around beams or joists, as the sharp bend will sometimes break one or more of the wires. Avoid running the cable in a doorway or corner where beer cases, etc. may be dropped on it, or jammed up against it.

- d - In drawing the cable through a plaster wall, if metal lath is used in the plaster, round out the hole and smooth down the sharp edges of the metal lath, to prevent a piece of the lath short circuiting the cable.

- e - Avoid crushing the cable behind a wall box when fastening the wall box against the wall.
3. Avoid short circuits in the cable from moisture.
- a - Don't run the cable along the floor where chemical compounds used in washing the floor can get into the cable and cause a short circuit.
 - b - Be careful that the cable is not run under pipes, etc., which drip in humid weather.

Where it is necessary to run the cable down through the floor, protect it from washing water by running it through a piece of copper tubing, which should extend at least 6" above the floor. About 12" of tubing should extend down out of the bottom of this hole. Bend the end of this tubing up to the ceiling, to form a loop. The last several inches of the tubing should be parallel to the ceiling.

The above will prevent water from running into the tubing at the top, and also prevent water from running down the tubing onto the outside of the cable.

5. METHODS OF CONCEALING WIRE.

Where wall boxes are mounted in ordinary booths, it is generally possible to drill holes in the booth table in the center and as close to the wall as possible, to allow the wires to come up through the table to the wall box. The cable can then come down to the moulding, run around the bottom of the wall, and over to the next booth. **DON'T RUN CABLES ALONG THE FLOOR OR ANY OTHER PLACE WHERE THEY WILL BECOME WET.**

In a good many locations, the booths along the side are set against a false paneling, which has several inches of space between it and the wall. By removing the cap strip on this paneling, it is generally possible to wire wall boxes in booths very easily.

Another procedure for concealing wires, which is used by a number of large operators because of its simplicity and economy, is to have any lumber company route a groove 1/2" deep and 1" wide in one side of 1x2 strips. The groove is wide enough to carry as many as four wall box cables and the strip is mounted against the wall with the groove inside. The exposed corners of the strip may be chamfered to improve the appearance if desired. This strip may be stained to match the finish in the location.

Wire mould is used by some operators to conceal wall box cables, and a complete listing of wire mould fittings for this purpose is given in the wall box instruction booklet.

6. LINE VOLTAGE IN LOCATION.

One of the greatest sources of trouble in any location, is in the line voltage. A constant voltage will insure proper working of the phonograph and wall boxes.

However, sometimes the phonograph is plugged into an outlet on which are operating Neon signs, refrigerators, etc., causing an extreme fluctuation in line voltage, which will invariably lead to improper voltage on box lines.

It is always best, if possible, to connect the phonograph to a line running directly to the fuse box in the building.

Next best is to connect the phonograph to a lightly loaded line.

If it is necessary to make an extension from the phonograph to the outlet, be sure that it is at least No. 14 wire size.

Don't make the mistake of using ordinary extension cord to plug in with a cut-off switch in the location, running any distance to phonograph mechanism, as low voltage will surely ensue, causing trouble.

7. INSTALLATION OF SPEAKERS.

Remote PM type speakers should be connected to the phonograph with rubber covered wire. Regular parallel rubber covered extension wire is suitable for this purpose.

Remote dynamic speakers should be connected with 4 wire rubber covered cable, which can be purchased from most good radio supply companies.

Do not at any time use the regular armoured cable for loud speaker purposes, because the voltages involved are higher than those which the armoured cable is designed for.

The PM type of speaker regularly furnished by this company has an 8 ohm voice coil in it, which will match up with most amplifiers.

If there is any doubt as to the type of output furnished by the amplifier which is to be used, it may be checked as follows:

Using an ohm meter, ascertain the resistance of the voice coil formerly used with this special amplifier. Multiplying this reading by 1.4 should come out approximately 8 ohms, to match up with the 8 ohm speaker. If the characteristics are different, it will

be necessary to purchase from a good radio store, a matching transformer having an input impedance corresponding to the output of the amplifier, and an 8 ohm output to match up with the Packard loud speaker.

IMPORTANT, WHERE OLD SPEAKERS, AMPLIFIERS, AND PICK-UPS ARE USED. Be sure to have a competent radio mechanic check any old speakers thoroughly. Make sure the cone is in good condition, the voice coil is properly centered, and that there is no accumulation of dust and dirt between voice coil and pole piece.

Amplifiers should be gone over carefully by the radio mechanic at the same time.

PICK-UPS should be checked and packed, if necessary, as described by that special phonograph manufacturer's manual.

8. PLACEMENT OF LOUD SPEAKERS.

In a location consisting of a room which is longer than it is wide, use one loud speaker at one of the ends of the room. In order to get good sound, it may be necessary to experiment somewhat with the exact position of the speaker.

Where the room is noisy, or where it is not possible by experimentation to get good sound from one speaker, two speakers, spaced equally on one of the long walls, preferably on the bar side, should be used.

In the use of more than one speaker, special connections and controls are required, so that the combined resistance of all the speakers, regardless of how many are turned on, or how many are turned to various volumes, remains approximately at the 8 ohm level.

Shown elsewhere in this booklet, are a number of diagrams for speaker connections, with various combinations of volume controls. The volume controls which are shown in these diagrams, can be purchased from any large radio supply house.

9. INSTALLATION OF VOLUME CONTROL WIRE.

The shielded braid on this wire is to prevent the picking up of extraneous hums and noises, which would otherwise be amplified through the sound system.

No special precautions are necessary with this wire, except that it should not be run in a conduit with other wires carrying current, and should never be run parallel to the speaker cable.

Do not let the braided shield come in contact with other terminals or connections.

Do not hammer insulated tacks, etc. so hard into the braided shield that the shield is driven into the center wire.

Unexpected noises, hums, etc. on first wiring up the installation, should always be checked through the volume control system first.

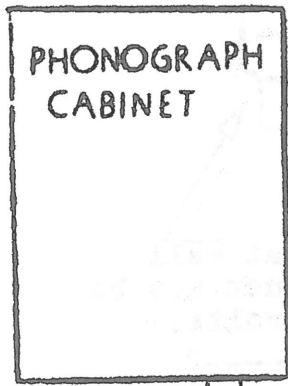
30-WIRE CABLE-CODE

30 WIRE CABLE

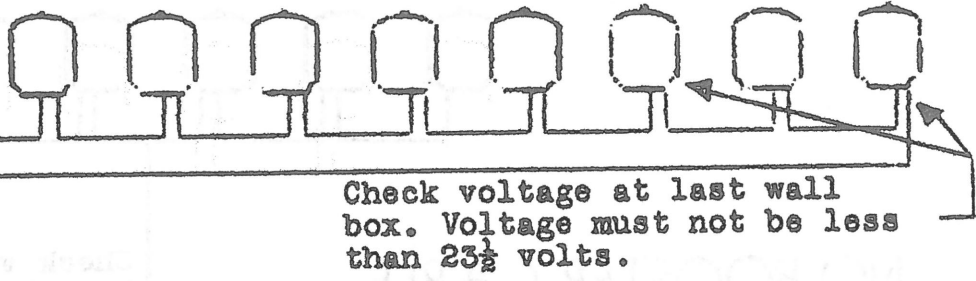
- | | |
|----|------------------------------|
| 1 | BLUE |
| 2 | ORANGE |
| 3 | GREEN |
| 4 | BROWN |
| 5 | SLATE |
| 6 | BLUE-WHITE |
| 7 | BLUE-ORANGE |
| 8 | BLUE-GREEN |
| 9 | BLUE-BROWN |
| 10 | BLUE-SLATE |
| 11 | ORANGE-WHITE |
| 12 | ORANGE-GREEN |
| 13 | ORANGE-BROWN |
| 14 | ORANGE-SLATE |
| 15 | GREEN-WHITE |
| 16 | GREEN-BROWN |
| 17 | GREEN-SLATE |
| 18 | BROWN-WHITE |
| 19 | BROWN-SLATE |
| 20 | SLATE-WHITE |
| 21 | BLUE-RED |
| 22 | ORANGE-RED |
| 23 | GREEN-RED |
| 24 | BROWN-RED |
| 25 | 6V. BLACK #16 STRANDED |
| 26 | 6V. BLACK-WHITE #16 STRANDED |
| 27 | 24V. RED #22 SOLID |
| 28 | SPARE RED-WHITE #22 SOLID |
| 29 | SPARE BLACK #22 SOLID |
| 30 | SPARE BLACK-WHITE #22 SOLID |

PROGRAM LIGHT WIRES

COMMON WIRES

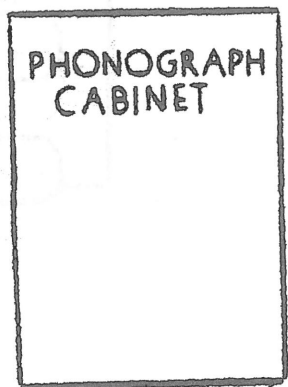


Voltage at power panel must not be over 25 volts.

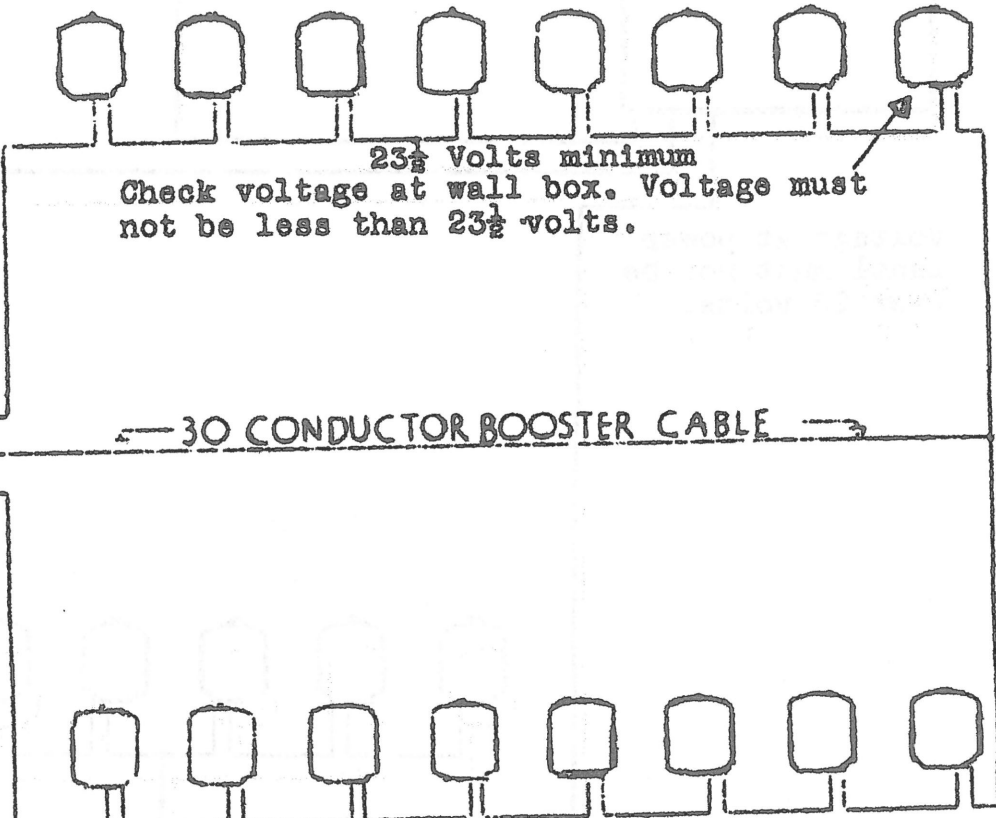


30 CONDUCTOR RETURN CABLE
 This cable should be installed where more than ten boxes are used on one cable. The purpose is to supply proper voltage to the boxes at the end of the line. Not necessary if voltage on last box is more than $23\frac{1}{2}$ volts.

TYPICAL EXAMPLES SHOWING CORRECT METHOD OF WIRING



Voltage at power panel must not be over 25 volts.



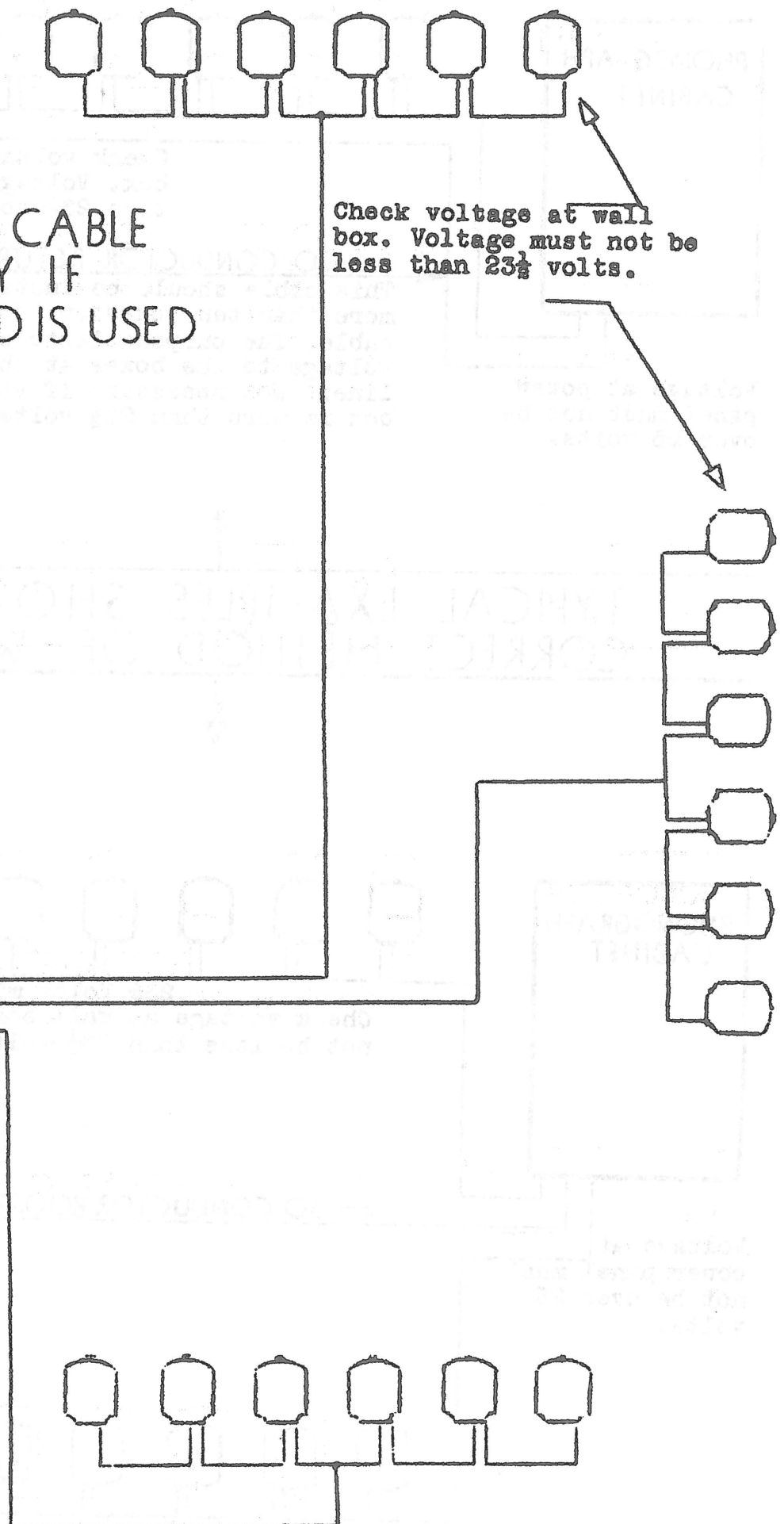
30 CONDUCTOR RETURN CABLE

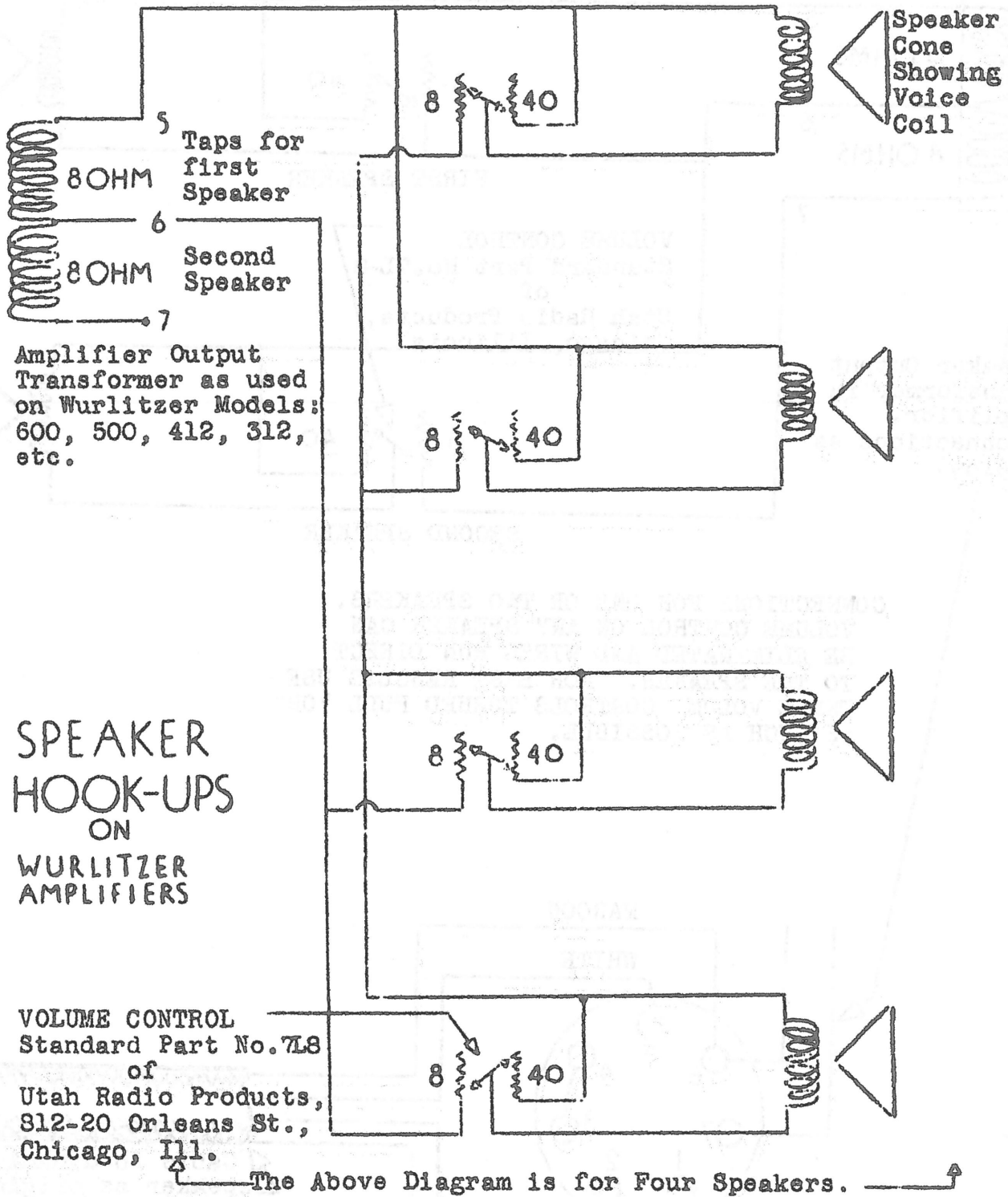
NO BOOSTER CABLE
IS NECESSARY IF
THIS METHOD IS USED

Check voltage at wall
box. Voltage must not be
less than $23\frac{1}{2}$ volts.

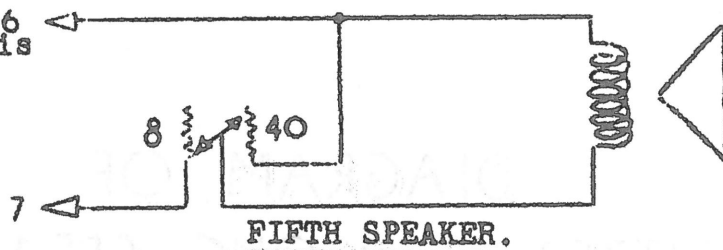
PHONOGRAPH
CABINET

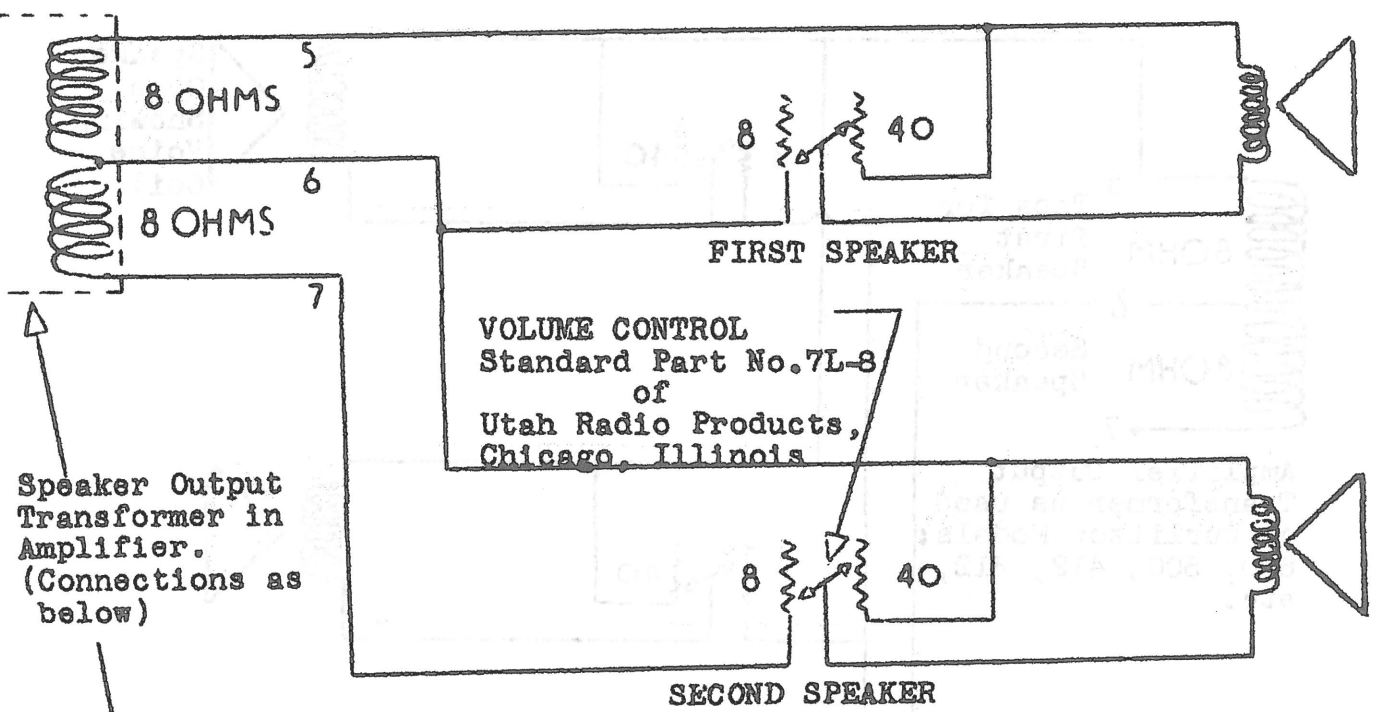
Voltage at power
panel must not be
over 25 volts.





If a fifth speaker is used, connect it to plug terminals Nos. 6 and 7, as shown here.





CONNECTIONS FOR ONE OR TWO SPEAKERS.
VOLUME CONTROL ON ANY SPEAKER CAN BE ELIMINATED AND WIRES RUN DIRECT TO THE SPEAKER. FOR BEST RESULTS USE THESE VOLUME CONTROLS TURNED FULL "ON" AS MUCH AS POSSIBLE.

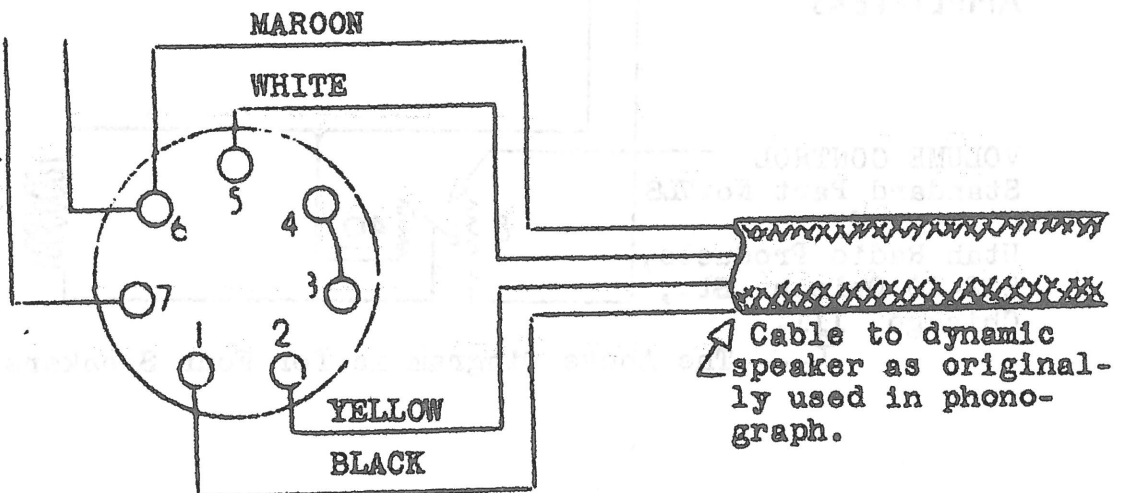
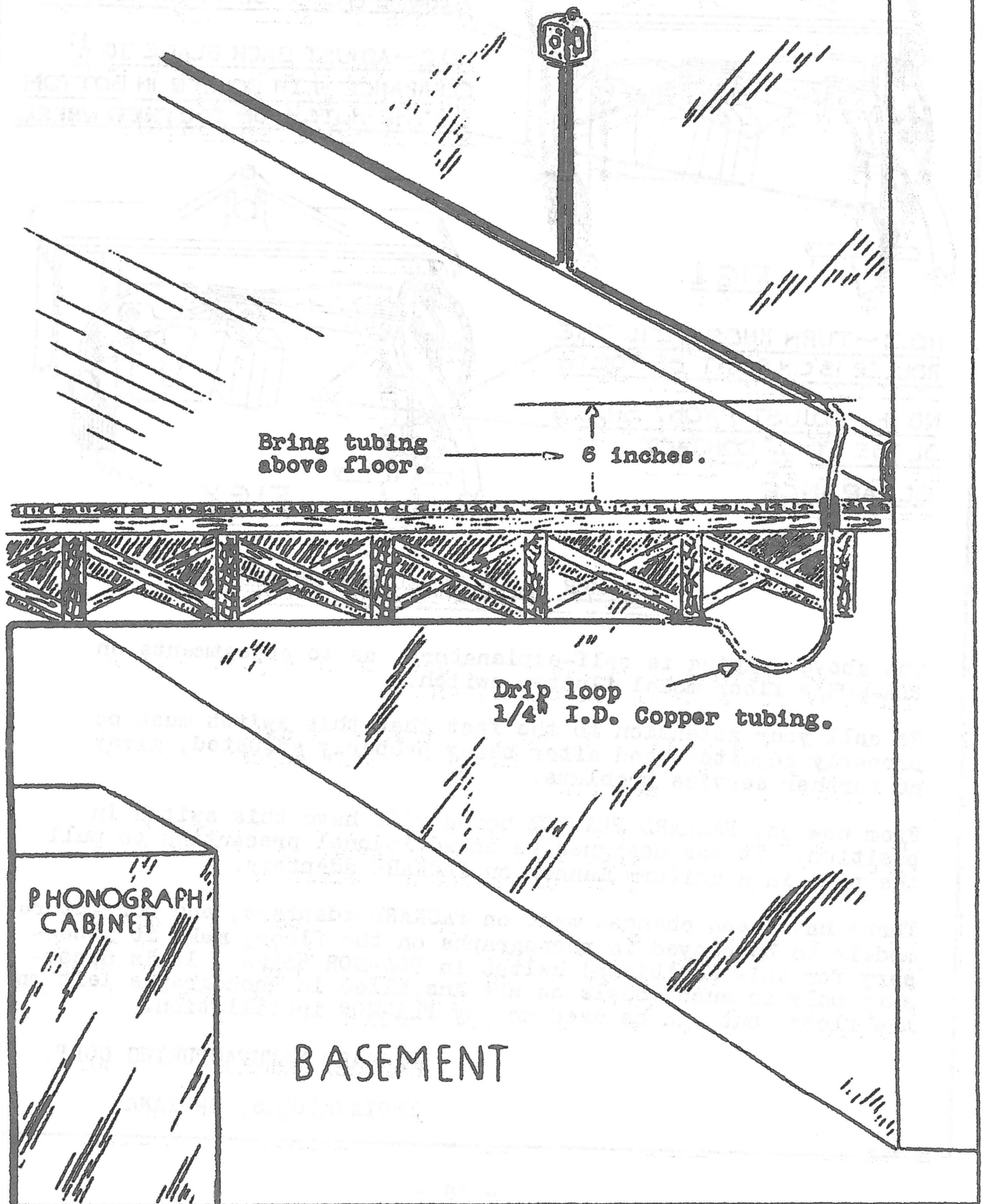


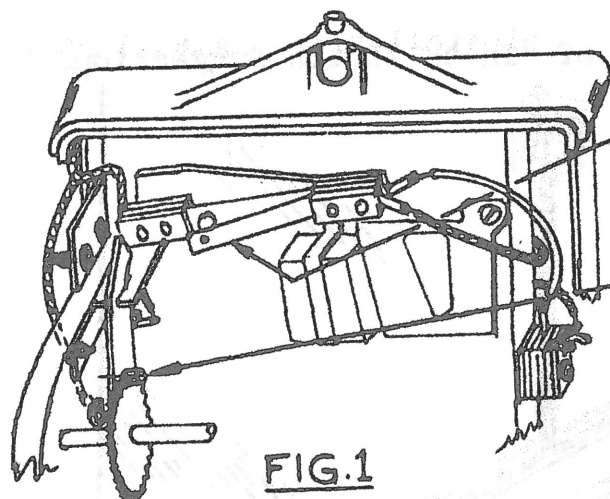
DIAGRAM OF
WURLITZER 7 PRONG SPEAKER PLUG

METHOD OF RUNNING CABLE TO BASEMENT WITH ADDITIONAL PROTECTION AGAINST MOISTURE.

(As Described in Paragraph 3 of "Installation Suggestions.")

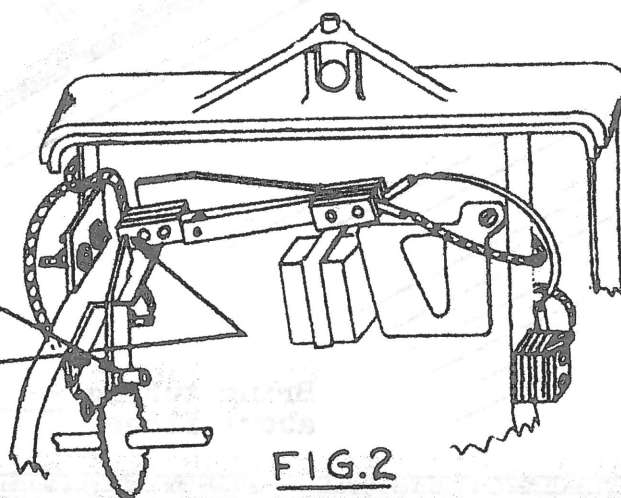


PLA-MOR BOX SWITCH INSTRUCTIONS



NO. 1—PULL HEAVY SWITCH BLADE FORWARD
ALLOWING BACK BLADE TO SWING FREE

NO. 2.—ADJUST BACK BLADE TO $\frac{1}{16}$ "
CLEARANCE WITH ROLLER IN BOTTOM
OF THE NOTCH ON TOOTHED WHEEL



NO. 3—TURN KNOB UNTIL THE
ROLLER IS ON POINT OF TOOTH

NO. 4—ADJUST FRONT SWITCH
BLADE TO $\frac{1}{32}$ " CONTACT
CLEARANCE

PLA-MOR FLOOR MODEL BOX SWITCH

The above drawing is self-explanatory, as to adjustments on PLA-MOR's floor model flutter switch.

We call your attention to the fact that this switch must be properly adjusted, and after being properly adjusted, gives no further service problems.

From now on, PACKARD PLA-MOR boxes will have this switch in position. It was designed as an additional precaution to pull the pins in a uniform manner on PACKARD adapters.

There have been changes made on PACKARD adapters, and our future models to be played in phonographs on the floor, make it necessary for this additional switch in PLA-MOR boxes. It is necessary only in such models as are installed in phonographs left on the floor, but can be used on any PLA-MOR installation.

PACKARD MANUFACTURING CORP.

INDIANAPOLIS, INDIANA