Western Electric

RA-330 AND RA-331 SOUND LEVEL METERS

Instruction Bulletin No. 1069

This page of instructions was prepared by the Ohio Bell Telephone Company in 1960

RA 330 Sound Meter

Setting Up For Operation

1. Remove the microphone from hinged door compartment at right end of sound level meter case and plug directly, or through medium of extension cord, into socket, marked "INPUT", on panel.
2. Set the attenuator knob, which is marked "DECIBELS", to "120".
3. Set the-20 db knob to "NORM".
4. Set the WEIGHTING knob to "40".
5. Set the meter switch to "FAST".
6. Turn the power switch to "ON" and allow meter to warm up about a minute.
7. Adjust the knob within the hinged door compartment at right end of case until meter indicating needle coincides with the red line. (Note: In the presence of extremely high sound pressure levels, the microphone may be removed for this step. Replace microphone before continuing with 8).
8. Press the "CAL" pushbutton and simultaneously rotate the flush knob (near the attenuator knob) until the indicator needle of the meter reads 7.5 db. When the indicator needle can no longer be adjusted to 7.5 db, the batteries should be replaced. (See section on "Batteries".)

   The meter is now ready for operation.

Up to 55 Db use 40 db weighting.
" " 85 " " 70 " "
Above 85 " " Flat "

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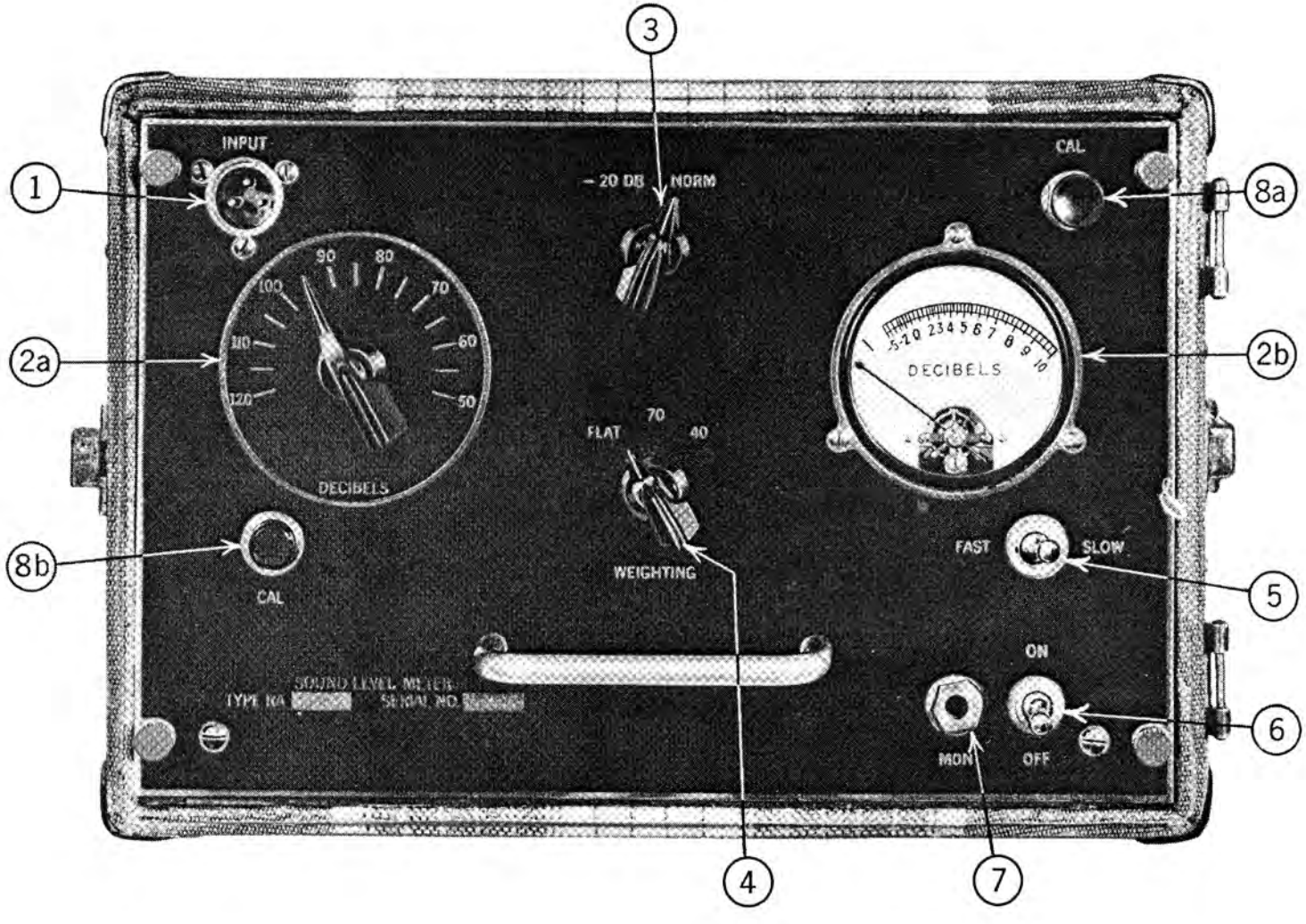


FIG. 1 — *RA-330 — RA-331 — Sound Level Meter*

RA-330 SOUND LEVEL MOTOR

INSTRUCTIONS

Installation of Vacuum Tubes

To install vacuum tubes, remove the four corner screws on the sound meter panel, open the hinged door on the right-hand side of the meter case to prevent damage to the microphone and lift the sound meter from the case by means of the handle on the panel. All tubes are of the RCA 1N5GT type with the exception of the lower left-hand tube (near the round black knob on the left hand side of the chassis as viewed from the rear), which is of the RCA 1D8GT type.

Batteries

Batteries are installed by removing thumb screws and panel as described above. The following batteries are required:

1 Burgess #6TA60

1 Burgess #Z

Since these batteries are not stocked by all dealers, it is generally found desirable to stock a spare set in anticipation of needs. Order from Burgess Battery Company, Freeport, Illinois.

The Burgess type 6TA60 battery is connected to the circuit by means of a four prong plug which is found in the lower left-hand corner looking at the front of the chassis. The type Z battery will be found held in place by spring clips at the right center of the chassis. The positive button or terminal of this battery should be towards the top or panel of the sound level meter.

It is suggested that if the sound level meter is to be stored for any period of time, it may be advantageous to remove the batteries.

Setting up for Operation

After the cover is removed, the following steps should be taken to calibrate the sound level meter, referring to Figure 1:

1. Remove the microphone from hinged door compartment at right end of sound level meter case and plug directly, or through medium of extension cord, into socket (1), marked "INPUT," on panel.
2. Set the attenuator knob (2A), which is marked "DECIBELS," to "120."
3. Set the 20 db knob (3) to "NORM."
4. Set the WEIGHTING knob (4) to "40."
5. Set the meter switch (5) to "FAST."
6. Turn the power switch (6) to "ON" and allow meter to warm up about a minute.
7. Adjust the knob within the hinged door compartment at right end of case until meter indicating needle (2B) coincides with the red line. (Note: In the presence of extremely high sound pressure levels, the microphone may be removed for this step. Replace microphone before continuing with 8).
8. Press the "CAL" pushbutton (8A) and simultaneously rotate the flush knob (8B) (near the attenuator knob) until the indicator needle of the meter (2B) reads 7.5 db. When the indicator needle can no longer be adjusted to 7.5 db, the batteries should be replaced. (See section on "Batteries.")

The meter is now ready for operation.

(A further overall meter check, is to remove the microphone and with WEIGHTING key (4) on "FLAT," measure the inherent meter noise level. If the level is over 25 db (see *"Operation"* on reading sound level meter), tubes or batteries should be replaced).

Operation

It is always desirable to approach a reading by starting with the attenuator knob (2A) at the high end and turning it clockwise until a reading is obtained on the meter. The sound pressure level of the noise is then the sum of the reading on the attenuator dial (2A) and that of the indicating meter (2B). The "—20 DB" knob (3) should normally be left in the "NORMAL" position, as this introduces a pad which reduces possible microphonic noise in the vacuum tubes. This knob should only be thrown to the "—20 DB" position when it is necessary to measure levels below 45 to 50 db. In such cases, 20 db should be subtracted from the sum of the readings on the dial (2A) and the meter (2B).

Relative to the selection of weighting networks, it is recommended that the following technique be employed in making sound level measurements:

Under ordinary conditions:

a. For levels up to about 55 db, the "40" db weighting position (knob 4) should be used.
b. For levels from about 55 db to 85 db, the "70" db weighting should be used.
c. For levels above 85 db, the "FLAT" weighting position should be used.

When low frequency noise predominates and large differences are observed between the readings obtained using the "40" db and "70" db weighting positions, it is recommended that the "40" db weighting position should be used for sound levels up to about 45 db, that the "70" db weighting position should be used for sound levels from 65 db to 75 db, and the "FLAT" weighting position should be used for sounds above 90 db. For sound levels between 45 db and 65 db, obtained with "40" db weighting, a more accurate determination of the sound level can be made by averaging readings obtained with the "40" db and "70" db weightings provided the latter is at the same time less than 65 db. Similarly, for sound levels between 75 db and 90 db, obtained with "70" db weighting, more representative values can be found by averaging readings obtained with the "70" db and "FLAT" weightings provided the latter is at the same time less than 90 db. For an understanding of the use of frequency weighting networks as a means of approximating loudness, reference should be made to "Speech and Hearing" by Harvey Fletcher (D. Van Nostrand Company), and to various articles appearing in the Journal of the Acoustical Society of America.

The indicating instrument used with this equipment is arranged to provide two speeds of response. When the indicating instrument speed key (5) is in the "FAST" position, the speed of response approximates the ballistic characteristics of the average human ear. With this setting, there will be a fluctuation of the meter when measuring fluctuating noise.

When the speed key is thrown to the "SLOW" position, the meter is highly damped, under which condition it proves useful when measuring highly fluctuating noise where the observer finds it difficult to make a satisfactory and consistent mental average.

When making readings, the attenuator should be set, if possible, at such a position that the whole swing will come within the scale of the indicating meter, and on the part of the scale where the most accurate readings can be made, that is, toward the right-hand or high end. In comparing impactive noises where the time constant of the meter enters to the maximum extent, it is desirable to adjust the attenuator so that all readings come as nearly as possible to the same part of the scale. In this way, the most accurate readings will be obtained.

A head set plugged in the monitoring jacks (7), marked "MON," permits the operator to hear the sound to be measured. At the same

time the indicating meter is removed from the circuit to avoid the possibility of erroneous readings. For monitoring, high impedance head phones should be used.

To obtain maximum battery life, it is suggested that the meter be turned off after a series of readings has been completed. When the meter is to be closed up for transportation, the microphone is placed in the spring clip on the inside of the hinged door to the right of the meter case. When the top cover is replaced, a spring clip will automatically turn off the meter to prevent running down the batteries when the sound meter is not in use.

RA-331 SOUND LEVEL MOTOR

INSTRUCTIONS

Installation of Vacuum Tubes

To install vacuum tubes, remove the four corner screws on the sound meter panel, open the hinged door on the right-hand side of the meter case to prevent damage to the microphone and lift the sound meter from the case by means of the handle on the panel. The tube complement is as follows: (2) type 6J7; (1) type 6AC7; (1) type 6H6; (1) type 6X5.

Setting up for Operation

1. With no power yet turned on, the indicating needle of the meter (2B) should coincide with the *black* line to the extreme left of the scale. Mechanical (screwdriver) adjustment may be necessary.

2. Open the small hinged door at the right end of the case, making the socket for the power cord accessible on the chassis. Plug into source of approximately 115 volts at 50 to 60 cycles, with the power cord provided.

3. Set the attenuator knob (2A), which is marked "DECIBELS," to "100."

4. Set the 20 db control (3) to "NORM.'

5. Set the "WEIGHTING" knob (4) to "40."

6. Set the meter switch (5) to "FAST."

7. Turn the power switch (6) to "ON" and allow meter to warm up about five minutes.

8. Adjust the knob within the hinged door compartment at right end of case until meter indicating needle (2B) coincides with the *red* line to the left of the meter scale.

9. Press the "CAL" push button (8A) and simultaneously rotate the flush knob (8B) (near the attenuator knob) until the indicator needle of the meter (2B) reads 7.5 db.

10. Remove microphone from clip on the small hinged door and plug directly (or through the medium of an extension cable) into socket (1) marked "INPUT," on panel.

The meter is now ready for operation.

A further overall meter check, is to remove the microphone and with WEIGHTING key (4) on "FLAT," measure the inherent meter noise level. If the level is over 30 db (see *"Operation"* on reading sound level meter), the two 6J7 tubes may be interchanged in position, or specially selected tubes of this type installed.

Operation

It is always desirable to approach a reading by starting with the attenuator knob (2A) at the high end and turning it clockwise until a reading is obtained on the meter. The sound pressure level of the noise is then the sum of the reading of the atenuator dial (2A) and that of the indicating meter (2B). The "—20 db" knob (3) should normally be left in the "NORMAL" position, as this introduces a pad which reduces possible microphonic noise in

the vacuum tubes. This knob should only be thrown to the "—20 db" position when it is necessary to measure levels below 45 to 50 db. In such cases, 20 db should be subtracted from the sum of the readings on the dial (2A) and the meter (2B).

Relative to the selection of weighting networks, it is recommended that the following technique be employed in making sound level measurements:

Under ordinary conditions:

a. For levels up to about 55 db, the "40" db weighting position (knob 4) should be used.

b. For levels from about 55 db to 85 db, the "70" db weighting should be used.

c. For levels above 85 db, the "FLAT" weighting position should be used.

Where low frequency noise predominates and large differences are observed between the readings obtained using the "40" db and "70" db weighting positions, it is recommended that the "40" db weighting position should be used for sound levels up to about 45 db, that the "70" db weighting position should be used for sound levels from 65 db to 75 db, and the "FLAT" weighting position should be used for sound above 90 db. For sound levels between 45 db and 65db, obtained with "40" db weighting, a more accurate determination of the sound level can be made by averaging readings obtained with the "40" db and "70" db weightings provided the latter is at the same time less than 65 db. Similarly, for sound levels between 75 db and 90 db, obtained with "70" db weighting more representative values can be found by averaging readings obtained with the "70" db and "FLAT" weightings provided the latter is at the same time less than 90 db. For an understanding of the use of frequency weighting networks as a means of approximating loudness, reference should be made to "Speech and Hearing" by Harvey Fletcher (D. Van Nostrand Company), and to various articles appearing in the Journal of the Acoustical Society of America.

The indicating instrument used with this equipment is arranged to provide two speeds of response. When the indicating instrument speed key (5) is in the "FAST" position, the speed of response approximates the ballistic characteristics of the average human ear. With this setting, there will be a fluctuation of the meter when measuring fluctuating noise.

When the speed key is thrown to the "SLOW" position, the meter is highly damped, under which condition it proves useful when measuring highly fluctuating noise where the observer finds it difficult to make a satisfactory and consistent mental average.

When making readings, the attenuator should be set, if possible, at such a position that the whole swing will come within the scale of the indicating meter, and on the part of the scale where the most accurate readings can be made, that is, toward the right-hand or high end. In comparing impactive noises where the time constant of the meter enters to the maximum extent, it is desirable to adjust the attenuator so that all readings come as nearly as possible to the same part of the scale. In this way, the most accurate readings will be obtained.

A head set plugged into the monitoring jacks (7), marked "MON," permits the operator to hear the sound to be measured. At the same time the indicating meter is removed from the circuit to avoid the possibility of erroneous readings. For monitoring, high impedance head phones should be used (approximately 50,000 ohms or higher).

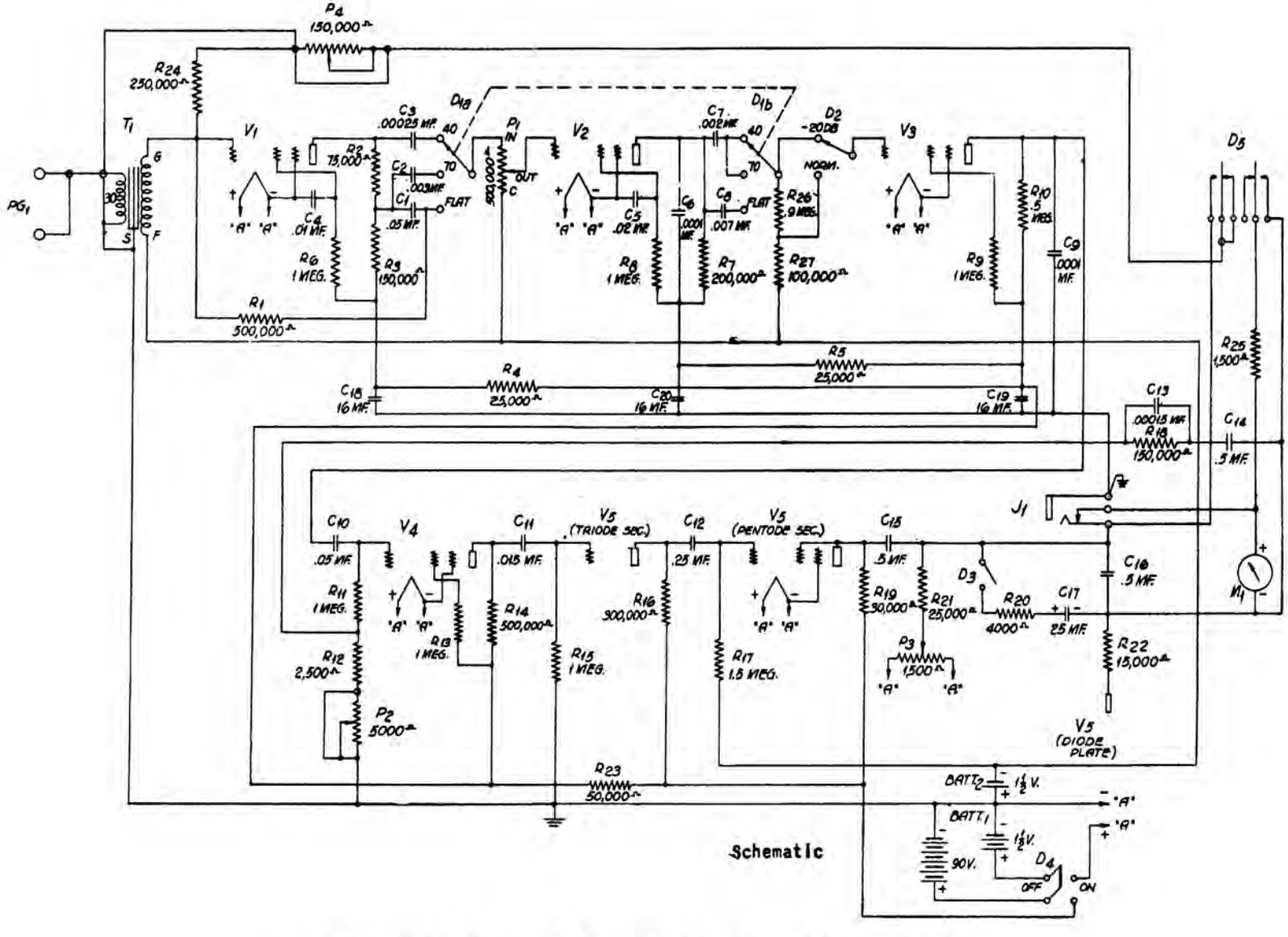
Where additional readings are to be taken in the same location at some later time (within a few hours), it may be advisable to leave the power turned on, but with the attenuator (2A) turned to position "120." This practice will make it unnecessary to wait while the apparatus warms up and no decrease in tube life will result when this is done. Since a large amount of negative feedback is included in the amplifier of the sound level meter, any drift in the calibration will be relatively small. For the maximum possible accuracy, however, a peri-

odic check of the calibration should be made in accordance with the instructions under "Setting up for Operation." This calibration check becomes increasingly important as large fluctuations in the line voltage (power source) are encountered. If, after the panel controls are set for calibration as outlined under "Setting up for Operation" and the "CAL" push button (8A) is pressed, the indicating needle does not go off scale, then the calibration is still accurate to within eight-tenths decibel. When the "CAL" push button (8A) is pressed, the decibel graduations on the meter scale do not give any direct reading of the *change* in gain.

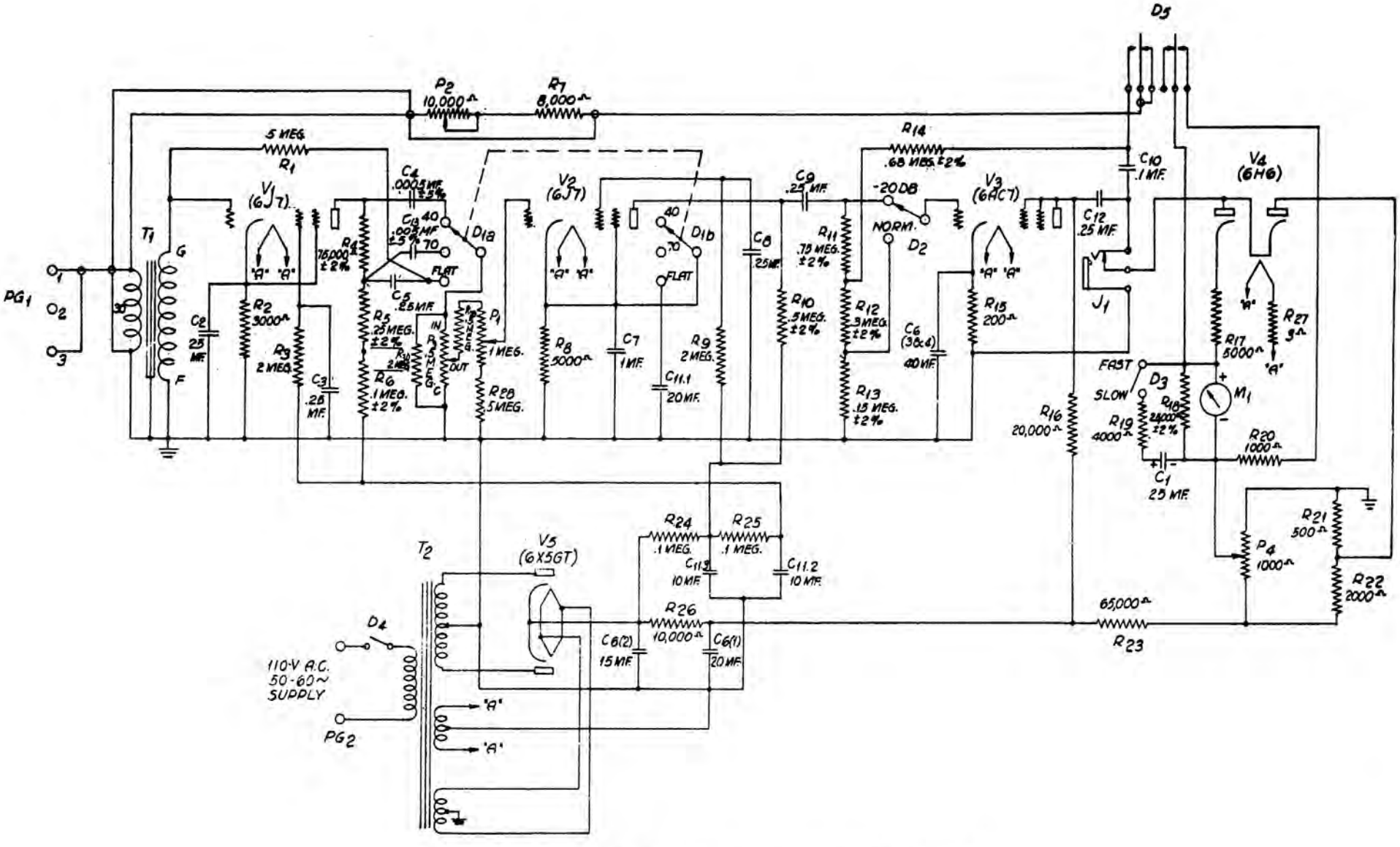
When the case is to be closed up for transportation, the microphone is placed in the spring clip on the inside of the small hinged door. The power cord may be coiled on holders provided inside the hinged top cover.

Caution

Since the microphone contains a strong permanent magnet structure, care should be taken that iron (filings or dust) is not picked up through the perforated end of the microphone case. Should a small amount of minute iron particles reach the face of the internal diaphragm, the response of the microphone will be changed. Under no circumstances should the user take apart or attempt repairs upon the microphone. If repairs are deemed desirable to any portion of the apparatus, the entire sound level meter should be returned to the manufacturer.



RA-330 Sound Level Meter — Schematic



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