/c

205AG

AUDIO SIGNAL GENERATOR

R R 2

HEWLETT-PACKARD

OPERATING AND SERVICING MANUAL

00090-

SPECIFICATIONS

FREQUENCY RANGE:
20 cps to 20 kc in three decade bands:

X1	20 cps	to	200 cps
X10	200 cps	to	2 kc
X100	2 kc	to	20 kc

Calibration covers approximately 270 degrees on 6 inch diameter main dial.

CALIBRATION ACCURACY:
Within ±2% at normal ambient temperatures. (Includes warm-up and changes due to aging of tubes and components.)

OUTPUT:
5 watts maximum into resistive loads of 50, 200, 600 and 5000 ohms. Output circuit is balanced and center tapped -- any terminal may be grounded.

FREQUENCY RESPONSE:
±1 db 20 cps to 20 kc at output levels up to +30 dbm with output meter reading held at +37 db, ±1.5 db 20 cps to 20 kc at output levels above +30 dbm with output meter reading held at +37 db (reference 1000 cps).

DISTORTION:
Less than 1% at frequencies above 30 cps.

INTERNAL IMPEDANCE:
Approximately 1/6 load impedance with zero attenuator setting. Approaches load impedance with attenuator settings of 20 db or more.

HUM LEVEL:
More than 60 db below the output voltage or 90 db below zero level (1 mw, 600 ohms), whichever is the larger.

OUTPUT METER:
Calibrated in volts and dbm (0 dbm = 1 mw, 600 ohms). Full scale values 65 volts, 37 dbm. Reads on 600 ohm basis regardless of output impedance selected.

OUTPUT ATTENUATOR:
Provides 110 db in 1 db steps.

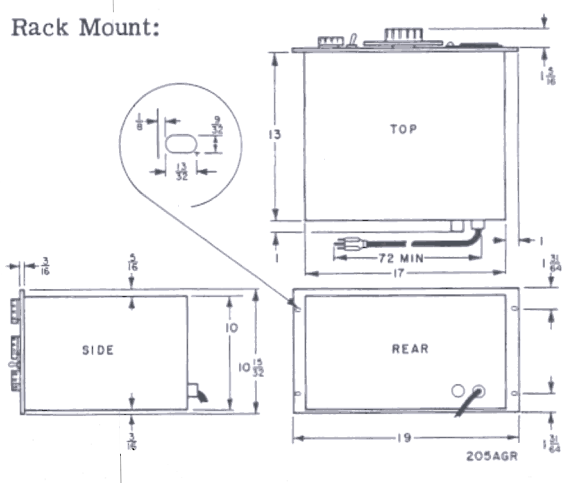
INPUT METER:
Calibrated in dbm (0 db = 1 mw, 600 ohms) from -5 to +8 dbm and in volts from 0 to 2 v rms. Voltage accuracy is ±5% of full scale.

INPUT ATTENUATOR:
Extends meter range to +48 dbm and to 200 v rms in 5 db steps. Accuracy +0.1 db.

POWER SUPPLY:
115/230 volts ±10%, 50-1000 cps, 150 watts.

DIMENSIONS:
Cabinet Mount: 20-3/4 in. wide, 12-3/4 in. high, 15-1/2 in. deep.

Rack Mount:



WEIGHT:
Cabinet Mount: 56 lbs, shipping weight 78 lbs.
Rack Mount: 49 lbs, shipping weight 71 lbs.

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SECTION I
GENERAL DESCRIPTION

1-1 GENERAL

The Model 205AG Audio Signal Generator contains all the necessary instruments for accurate gain or frequency response measurements. Any desired frequency range within the range of 20 to 20,000 cycle/sec. is made available by the resistance-tuned audio oscillator within the instrument. In addition to the audio oscillator, two voltmeters are provided. One voltmeter measures input to and the second measures output from the device under test. An attenuator is provided to set the output voltage at any desired level. The output impedance can be changed by means of a selector switch to 50, 200, 600, or 5000 ohms.

This audio signal generator is typically used for amplifier gain measurements, network frequency response, source of voltage for distortion measurements, broadcast transmitter audio response, loudspeaker response, general laboratory application, and production testing.

1-2 INSPECTION

After the instrument is unpacked, it should be carefully inspected for damage received in transit. If any shipping damage is found, follow the procedure outlined in the "Claim for Damage in Shipment" page in this instruction manual.

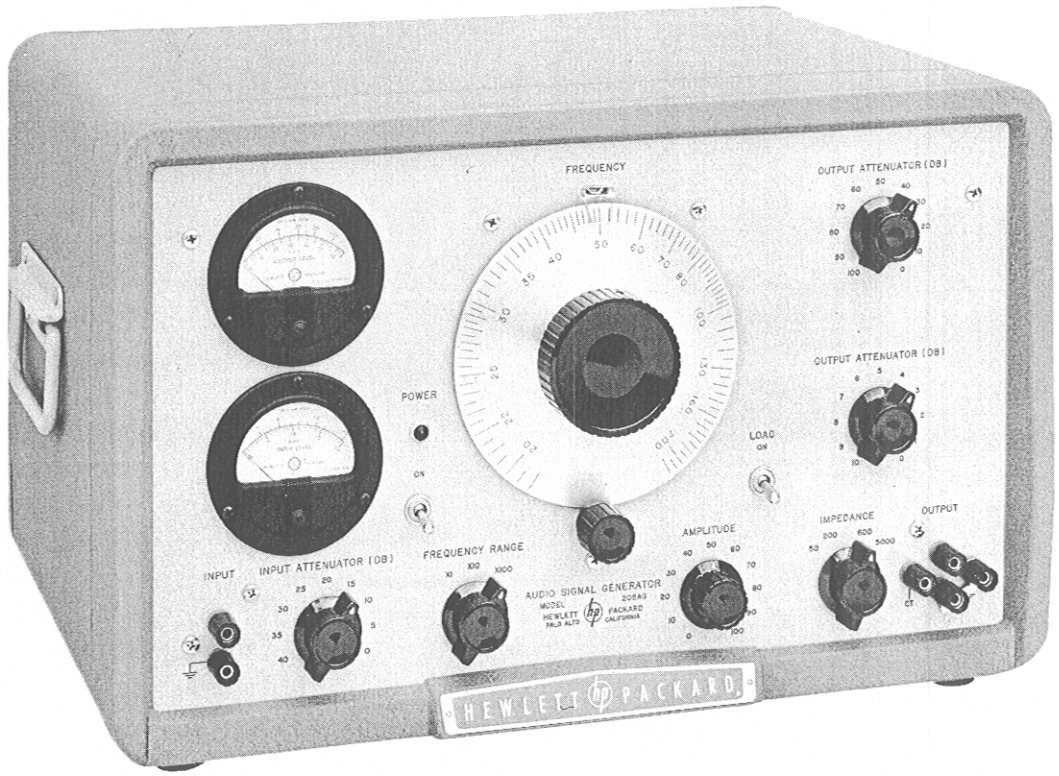

Figure 1-1. Audio Signal Generator

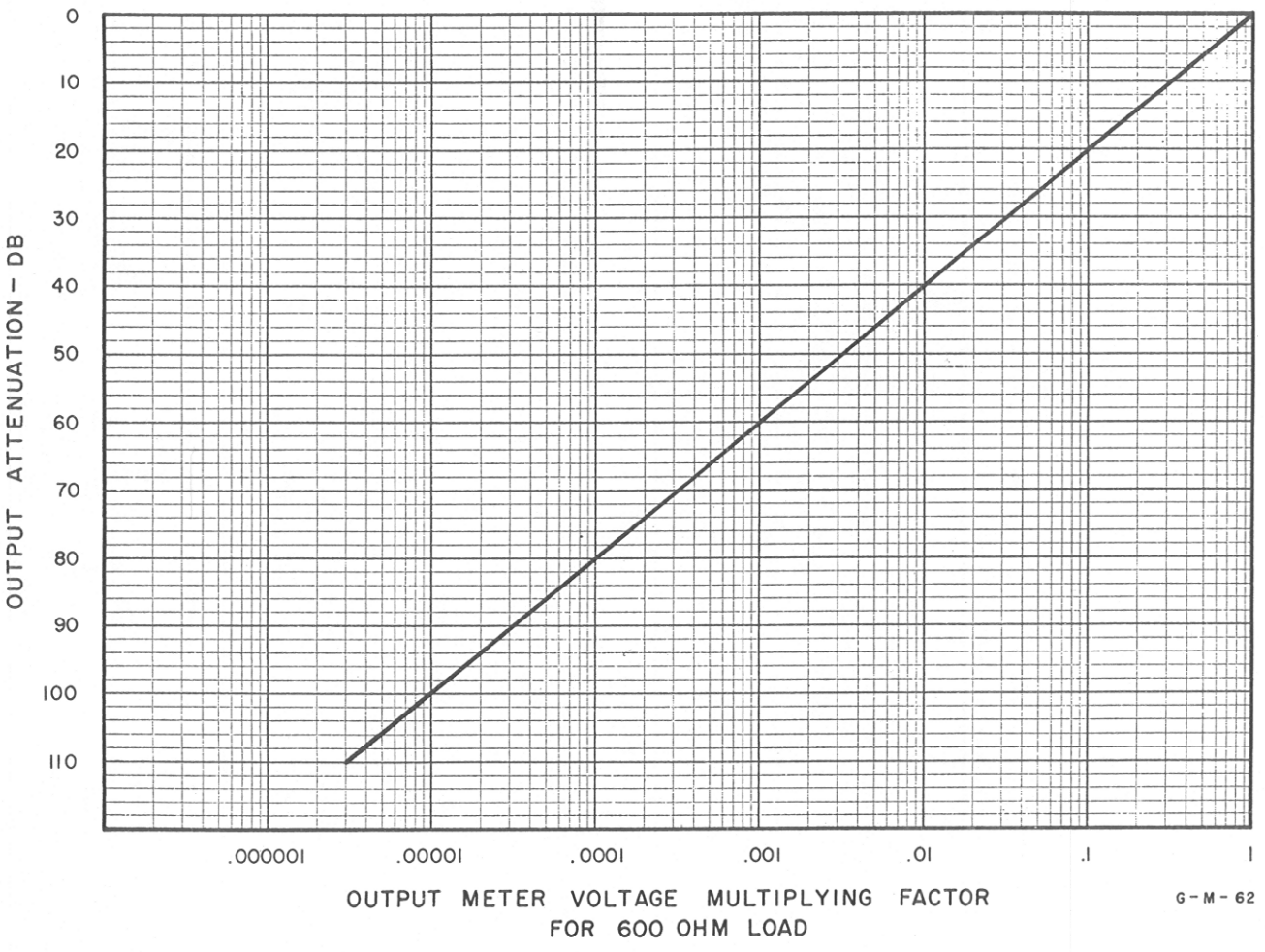

Figure 2-1. Output Voltage Correction Factors When Using Output Attenuators

SECTION II
OPERATING INSTRUCTIONS

2-1 CONTROLS AND TERMINALS

POWER ON
This switch controls the power supplied to the instrument from the power line.

LOAD ON
This switch is used to connect an internal load across the OUTPUT terminals.

INPUT
These terminals are the input for the audio frequency INPUT LEVEL vacuum tube voltmeter in the instrument.

INPUT ATTENUATOR (DB)
This switch is the range switch for the INPUT LEVEL meter and is calibrated in steps of 5 db from 0 to 40 db.

FREQUENCY RANGE
The position of this switch indicates the multiplying factor to be used with the frequency dial indication.

FREQUENCY Dial
This dial is calibrated in cycles per second. The output frequency is the frequency dial indication multiplied by the FREQUENCY RANGE switch position.

AMPLITUDE
This control adjusts the amplitude of oscillator voltage applied to the output amplifier. The calibration is in arbitrary units.

IMPEDANCE
This switch selects the instrument output impedance. The available impedances are 50, 200, 600, and 5000 ohms.

OUTPUT
The instrument output appears at four terminals. The terminal marked CT is the center tap of the line matching transformer. The ⏚ terminal is connected to the chassis. The two vertically spaced terminals are connected to the line matching transformer through the IMPEDANCE switch. A balanced output is obtained from the vertically spaced terminals and an unbalanced output may be obtained by connecting the ⏚ terminal to one of the output terminals with the captive link provided.

OUTPUT LEVEL
This meter indicates the voltage at the output terminals when the IMPEDANCE switch is set at 600, output attenuators both at zero, and the instrument is loaded with the internal or an external 600 ohm load. Under other operating conditions the meter may be used as a monitor to insure constant output voltage.

INPUT LEVEL
This meter measures the voltage applied to the input terminals and the range of the meter is controlled by the INPUT ATTENUATOR (DB) range switch.

FUSE
The fuseholder, located on the back of the chassis, contains the power line fuse. Refer to the Table of Replaceable Parts for the correct fuse rating.

Power Cable
The three conductor power cable is supplied with a NEMA approved three-prong plug. The third conductor provides a chassis ground. An adapter may be obtained to permit use of this plug with two-conductor receptacles.

OUTPUT ATTENUATORS
These two attenuators are used to reduce the output level in one db steps to a maximum of 110 db below the output level indicated on the OUTPUT LEVEL meter.

2-2 OSCILLATOR OPERATION

The procedure for operating the Model 205AG Audio Signal Generator is as follows:

a. Connect the instrument power cable to a 115/230 V alternating current power line and the output terminals to the equipment being tested. Set the IMPEDANCE switch to match the load. When the Signal Generator is operated into a high impedance

load, the Load Switch must be turned on, otherwise the Output Level Meter and the Attenuator indications will not be correct. The Load Switch should be off when the instrument is connected to loads within the range of the line matching impedances.

b. Turn the power switch to ON and allow approximately five minutes for the instrument to stabilize. Set the Freq. Range control and the frequency dial so that their indications when multiplied together equal the desired frequency. For example: Frequency dial indication 20, FREQUENCY RANGE X100, 20 x 100 = 2000 cycles/second.

c. Set the output attenuators and the AMPLITUDE control to obtain the desired output level. Distortion in the output will be minimized by keeping the Output Level meter indication near maximum and reducing the output with the output attenuators.

2-3 OUTPUT LEVEL METER OPERATION

The Output Level meter is calibrated directly in output voltage and db above 1 milliwatt when the instrument is operating into a 600 ohm load and both output attenuators are set at zero.

With any matched load (50, 200, 600, or 5000 ohms) the output power in db above or below 1 milliwatt is equal to the Output Level Meter indication less the output attenuator settings. For example: an Output Level meter indication of +35 db and a total output attenuation of 45 db will produce an output level of -10 dbm into a matched load.

Figure 2-1 is a chart of meter voltage multiplying factors for any value of output attenuation. With the IMPEDANCE switch set at 600 ohms and an internal or external 600 ohm load, the output voltage will be the Output Level meter voltage indication multiplied by a factor obtained from Figure 2-1 opposite the total output attenuation. For example: with the output attenuators set for 40 db all Output Level meter indications should be multiplied by .01 to obtain the true output voltage into a 600 ohm load.

To obtain the true output voltage into a 50, 200 or 5000 ohm load the following factors must be applied to the true voltage across a 600 ohm matched load.

Load Impedance	600 Ohm Voltage Multiplying Factor
50	0.289
200	0.577
5000	2.89

For example: with an Output Level Meter indication of 40 volts and the output attenuators set at 40 db, we find from Figure 2-1 that the true output voltage into 600 ohms would be 40 volts multiplied by 0.01 or 0.4 volts. To convert this to a voltage across a 200 ohm matched load multiply by 0.577 or 0.4 x 0.577 = 0.2308 volts.

2-4 INPUT LEVEL METER OPERATION

The Input Level meter is an independent audio frequency vacuum tube voltmeter, suitable for monitoring the output voltage of a device under test. The meter is calibrated in volts and db above 1 milliwatt in 600 ohms when the INPUT ATTENUATOR (DB) switch is on zero.

When making comparative measurements across a constant impedance the meter and INPUT ATTENUATOR (DB) switch will indicate directly the change in db in the circuit under test.

When using the Input Level meter to monitor a 600 ohm circuit, the power level in db above 1 milliwatt is equal to the meter indication plus the indication of the INPUT ATTENUATOR (DB) switch.

When making power measurements in circuits with impedances below 600 ohms, the absolute level in db above or below 1 milliwatt is equal to the level indicated on the meter plus the INPUT ATTENUATOR (DB) switch indication plus a correction factor for the circuit impedance. Figure 2-2 gives correction factors for impedances between 1 and 600 ohms.

The input voltage level for any range of the INPUT ATTENUATOR (DB) switch is the voltage indicated by the Input Level meter multiplied by the factor indicated below for the particular range of the INPUT ATTENUATOR (DB) switch in use.

INPUT ATTENUATOR (DB) Position	Meter Voltage Multiplying Factor
0	1
5	1.78
10	3.16
15	5.62
20	10
25	17.78
30	31.62
35	56.23
40	100

Figure 2-2. Input Level Meter Correction Curve

SECTION III
CIRCUIT DESCRIPTION

3-1 GENERAL

The Model 205AG Audio Signal Generator consists of an oscillator, an amplifier, output meter and attenuator, line matching transformer, and a conventional power supply (see Figure 3-1).

The oscillator section (tubes V1 and V2) is a resistance-tuned type circuit. Basically, this oscillator is a two-stage resistance-coupled amplifier which is caused to oscillate by the use of a positive feedback network. This network is a frequency-selective resistance-capacity combination which controls the frequency of oscillation. By using a variable tuning capacitor for the capacity of the network, it is possible to tune the oscillator over a wide 10:1 range; and by using a switching arrangement to select different values of resistance for the network, several ranges are given to the oscillator.

Negative feedback is used in the oscillator section in order to minimize distortion and to obtain a very high order of stability. The amount of negative feedback is determined by a resistance network, one element of which is non-linear (the 3-watt lamp in the cathode of V1). This element controls the amount of feedback in accordance with the amplitude of oscillation and consequently maintains the amplitude of oscillation substantially constant over a wide frequency range. The negative feedback also keeps the operation of the system on the linear portion of the tube characteristic.

The amplifier section consists of a voltage amplifier tube directly coupled to a phase inverter which drives the push-pull output tubes. The tertiary winding on the output transformer provides negative feedback for the amplifier.

The output meter and attenuator section is made up of an average reading type voltmeter and two bridged T-type attenuators. The attenuators and voltmeter are connected between the output transformer secondary and the primary of the line matching transformer.

A full-wave rectifier and a dc milliammeter calibrated in volts and decibels make up the Output Level meter. The line matching transformer is used to change the 500 ohms line impedance to 50, 200, 600, or 5,000 ohms output impedance.

The Model 205AG also includes an Input Level meter which is of the average responding type. The meter consists of a two stage amplifier with negative feedback, a full-wave rectifier and a dc milliammeter calibrated in volts and decibels.

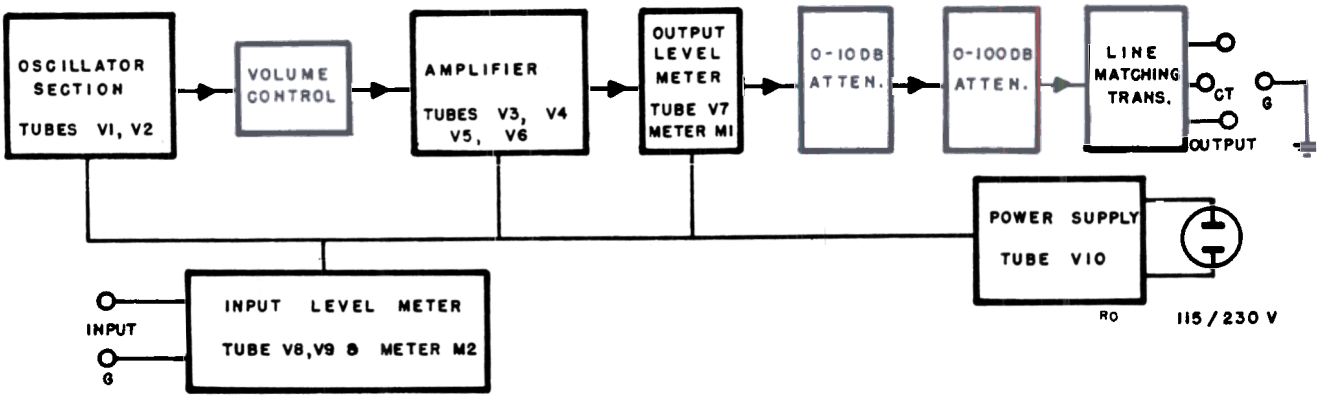

Figure 3-1. Block Diagram Model 205AG

SECTION IV
MAINTENANCE

4-1 CABINET REMOVAL

Remove four screws from the rear of the cabinet and remove the rear cover. Place instrument on its back, and loosen the two screws located on the underside of the front panel bezel. Free cabinet and lift from instrument.

4-2 TUBE REPLACEMENT

The tubes in this instrument may be replaced with any tube having EIA standard characteristics. Whenever a tube is replaced, with the exception of V7 or V8, the distortion should be measured to see that it does not exceed the specifications. When tubes V7 or V8 are replaced it may be necessary to adjust the zero setting of their respective meters.

4-3 DISTORTION

Excessive distortion may be caused by defective tubes, open by-pass capacitors, and low voltages.

4-4 CAPACITOR DRIVE LUBRICATION

The capacitor drive should be lubricated once a year. Remove the cover plate from the top of the capacitor shield. Put one drop of light oil on each of the bearings on the small gear shaft at the top of the drive. The capacitor ball bearings do not need lubrication.

4-5 FREQUENCY CALIBRATION ADJUSTMENT

The range switch resistors R1 to R6 inclusive in conjunction with the tuning capacitor assembly C1 and C2, determine the frequency of the oscillation of the unit and also affect the amplitude. If the output frequency is not within 2% of that indicated by the dial, or if the amplitude varies more than ±1/2 db from 200 to 2000 cps, the following procedure is recommended.

NOTE

For all adjustments the output must be loaded with the internal load. Turn the LOAD switch ON.

The frequency calibration will be correct only when the shields around and above the main tuning capacitor are firmly in place.

Using a gentle airstream, blow out any dust that may be present on the tuning capacitor.

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a. Check for proper setting of dial on shaft. At one end of the frequency dial will be either a small dot or an extra line. This should be under the indicator hairline when the tuning capacitor is at that end of its travel. This may be adjusted by loosening set screws on one side of the coupler behind the panel, then rotating the dial until correctly lined up.

Check and tighten all set screws in the dial drive mechanism.

b. Turn on the instrument and allow at least 30 minutes for it to warm up.

c. Set to X10 range and dial to 20. Set the output meter to 50 volts. Change dial setting to 200. The panel output meter should then read 50 volts ±2 volts and the frequency should be 2000 cps ±2%. If both frequency and amplitude are in error, adjust C1 and C22 for the best compromise between correct frequency and correct amplitude.

d. Check tracking of the rest of the frequency dial. If there is no constant error in tracking, proceed with the next step. If there is a constant error, proceed with one of the following methods, whichever is the easiest.

1. Loosen set screws and reset the dial to take the error into account, then repeat steps b and c. This method is best if the other ranges also have a constant error in the same direction.

2. Change the small padding resistors in series with the precision resistor on the range switch. Increasing the value of the resistor by 10,000 ohms will lower the frequency of the range approximately 1%; decreasing the value of this resistor will raise the frequency of the range. * Retrace steps a through d.

e. When the X10 range has been properly adjusted, the other ranges may be adjusted as follows:

1. X100 range
Change the padding resistor in series with the precision resistor. A change of 1000 ohms will change the frequency approximately 1% on this range. Then 20,000 cycles on the dial is corrected by varying C-7. A change of 50 to 200 pf is usually adequate.

2. X1 range
An increase of 100K ohms in the padding resistor will decrease frequency approximately 1% on this range. There may be a small tracking error (less than 2%) at the top or the bottom of the X1 range. This is normal to the instrument and cannot be eliminated.

f. If satisfactory calibration cannot be obtained in the above manner, it may be necessary to return the instrument to an authorized repair station or the factory.

4-6 OUTPUT LEVEL METER ADJUSTMENT

The procedure for adjusting the Output Level meter is as follows:

a. With the instrument operating and Vol. control at zero, adjust the meter pointer to zero with zero adjustment screw on the meter.

b. Connect an accurate vacuum tube voltmeter across the 600 ohms output terminals with the 600 ohms internal load switched on. Set the instrument for 100 cycles/sec. output, zero attenuation, and adjust the Vol. control until the external voltmeter indicates 55 volts. Adjust the variable resistor R29 until the Output Level meter indicates exactly 55 volts. The resistor R29, which is reached through a hole in the back of the chassis, can be turned with a screwdriver.

* Up to 1% change in frequency on any range may be made by adjusting only one of the two range resistor padders on that range. If a greater frequency change is needed, adjust both padders. If this is not done, the relative amplitude between ranges will be affected.

4-7 INPUT LEVEL METER ADJUSTMENT

This meter is adjusted as follows:

a. With the instrument operating, short circuit the Input Terminals. Adjust the meter pointer to zero with zero adjustment screw on the meter.

b. Connect the Input terminals to the Output terminals and set the instrument controls as follows:

Control	Setting
INPUT ATTENUATOR (DB)	0
FREQUENCY RANGE	X10
FREQUENCY dial	40
LOAD	~~ON~~
IMPEDANCE	5000
OUTPUT ATTENUATOR (DB)	40
OUTPUT ATTENUATOR (DB)	6
AMPLITUDE	to obtain 53 v on OUTPUT LEVEL METER

The Input Level meter should indicate zero db with the controls set as above. If the meter indication is incorrect, adjust the variable resistor R47 to correct the meter indication. The variable resistor R47 is reached through a hole in the left side of the chassis. (Instrument removed from cabinet.)

c. After the zero db level is in adjustment, change the attenuators to 41 db and 51 db which will indicate + 5 db and -5 db respectively. If the meter tracking at these points is not satisfactory, then the ~~6H6 tube V9 should be replaced and the above adjustments repeated.~~

4-8 REPLACEMENT OF LAMP R11

The 3-watt lamp R11 is operated at a very low level and should have an almost infinite life. Therefore, the lamp should not be changed indiscriminately. However, should the lamp require changing, it is necessary to measure the ac voltage from the junction of R58 and C4 to the chassis with the new lamp in the circuit. This voltage should be measured with a high impedance vacuum tube voltmeter such as Hewlett-Packard Models 400C, 400D, or 410B.

To make this measurement and adjustment, the instrument must be removed from the cabinet. Set

the oscillator frequency to 1000 cycles/sec. and vary the resistor R19 so that 21 to 25 volts is obtained. The resistor R19 is mounted on the shield surrounding the Freq. Range Switch.

If the voltage cannot be brought within the 21 to 25 volts range by means of R19, the new lamp should be rejected in favor of another.

4-9 INTERMITTENT OUTPUT

"Jumpy" or intermittent output accompanied by flashing of the 3-watt oscillator lamp (R11) is a reliable indication of a short in trimmer capacitor C1 or in the first two sections of the main tuning capacitor. If these symptoms occur, search out and clear the short with a weak air jet or other means. Do not bend the capacitor plates because bending capacitor plates will destroy the frequency calibration.

A short in the back two sections of the main tuning capacitor will prevent the circuit from oscillating. Any such short should be cleared as explained above.

TABLE 4-1. TROUBLESHOOTING CHART

The following is a listing of possible symptoms, causes and remedies

SYMPTOMS	CAUSES	REMEDIES
Instrument inoperative (Indicator lamp won't light, no audio output)	Blown fuse.	Clear short circuit and replace fuse.
Instrument inoperative (Indicator lamp lights, no audio output)	Defective tube. Check the 5U4GA/B tube first.	Replace tube.
	Short circuit in DC power circuit capacitor.	Replace capacitor.
	Short circuit in C2 (two rear sections)	Clear the short circuit as outlined in Paragraph 4-9.
Intermittent output	Capacitors C3, C4, C5, C8 or C9 intermittently open.	Replace capacitor.
	Short circuit in C2 (two front sections) or C1.	Clear the short circuit as outlined in Paragraph 4-9.
Output Level Meter inoperative.	6H6 tube V7 defective.	Replace tube.
Excessive distortion.	Defective tube.	Replace tube.
	Open circuit in capacitor C10 abc, C15, C16, C17, or C18.	Replace capacitor.
	Defective output or line matching transformer	Replace transformer.

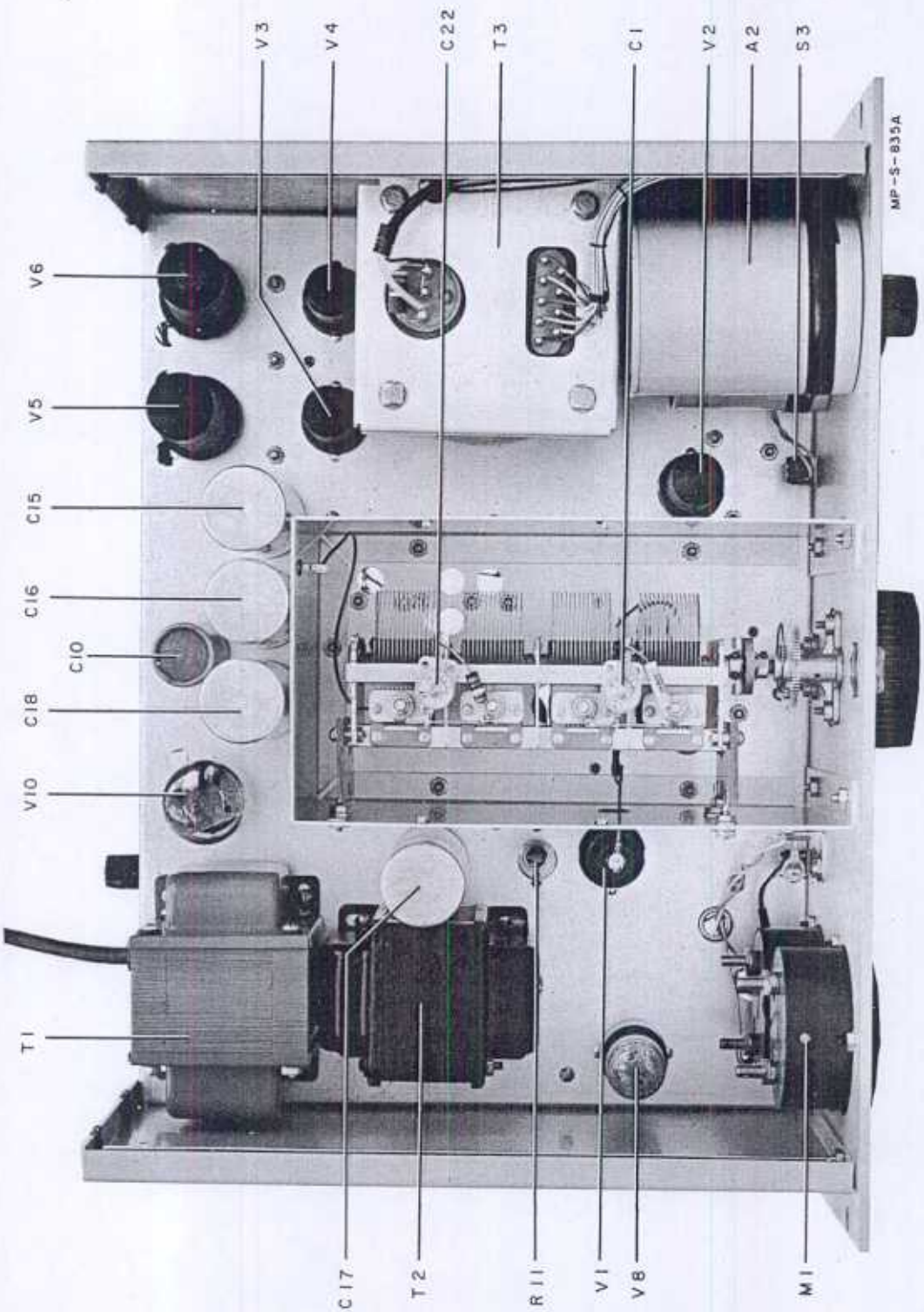


Figure 4-1. Model 205AG Top View Cabinet Removed

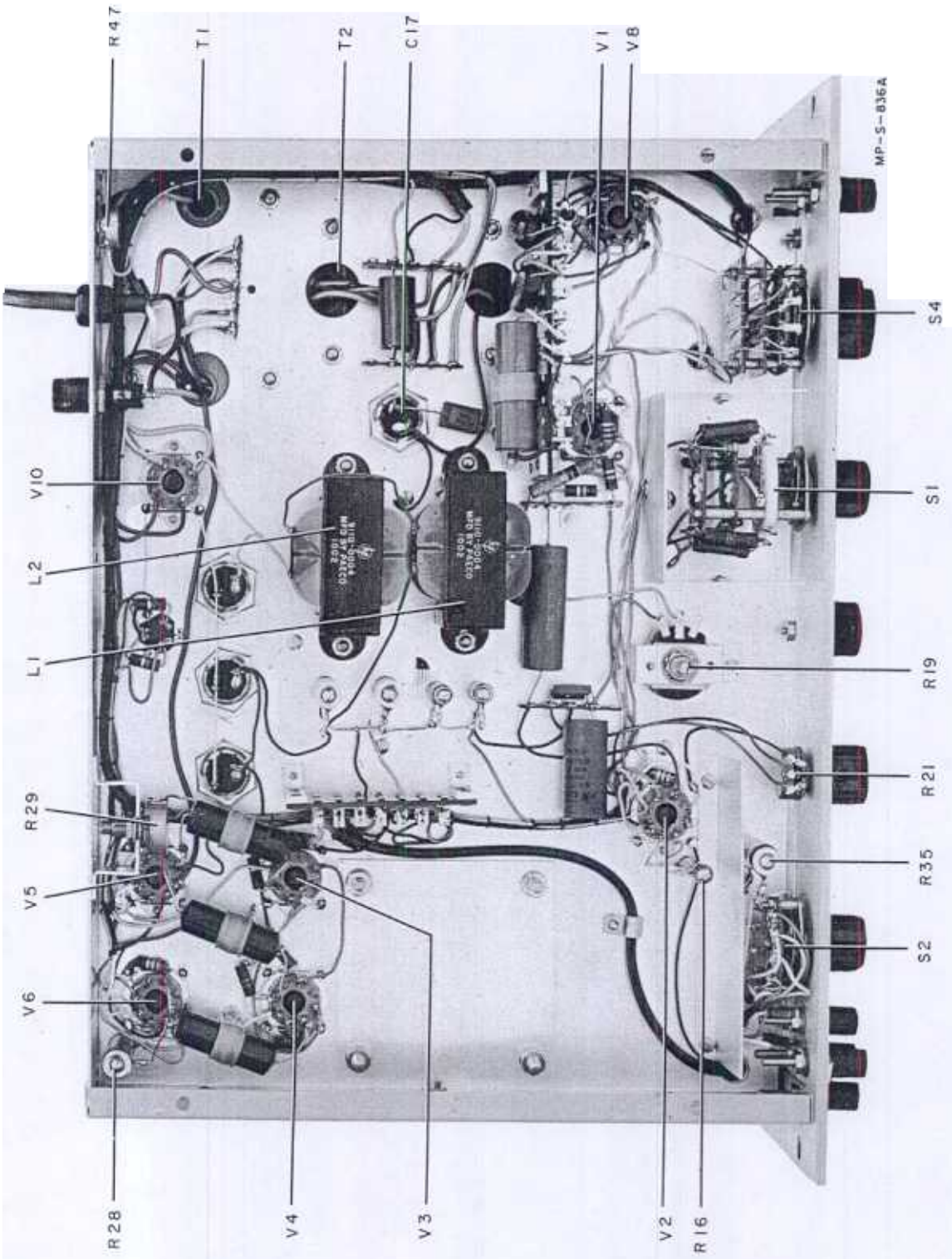


Figure 4-2. Model 205AG Bottom View Cabinet Removed

00090-2

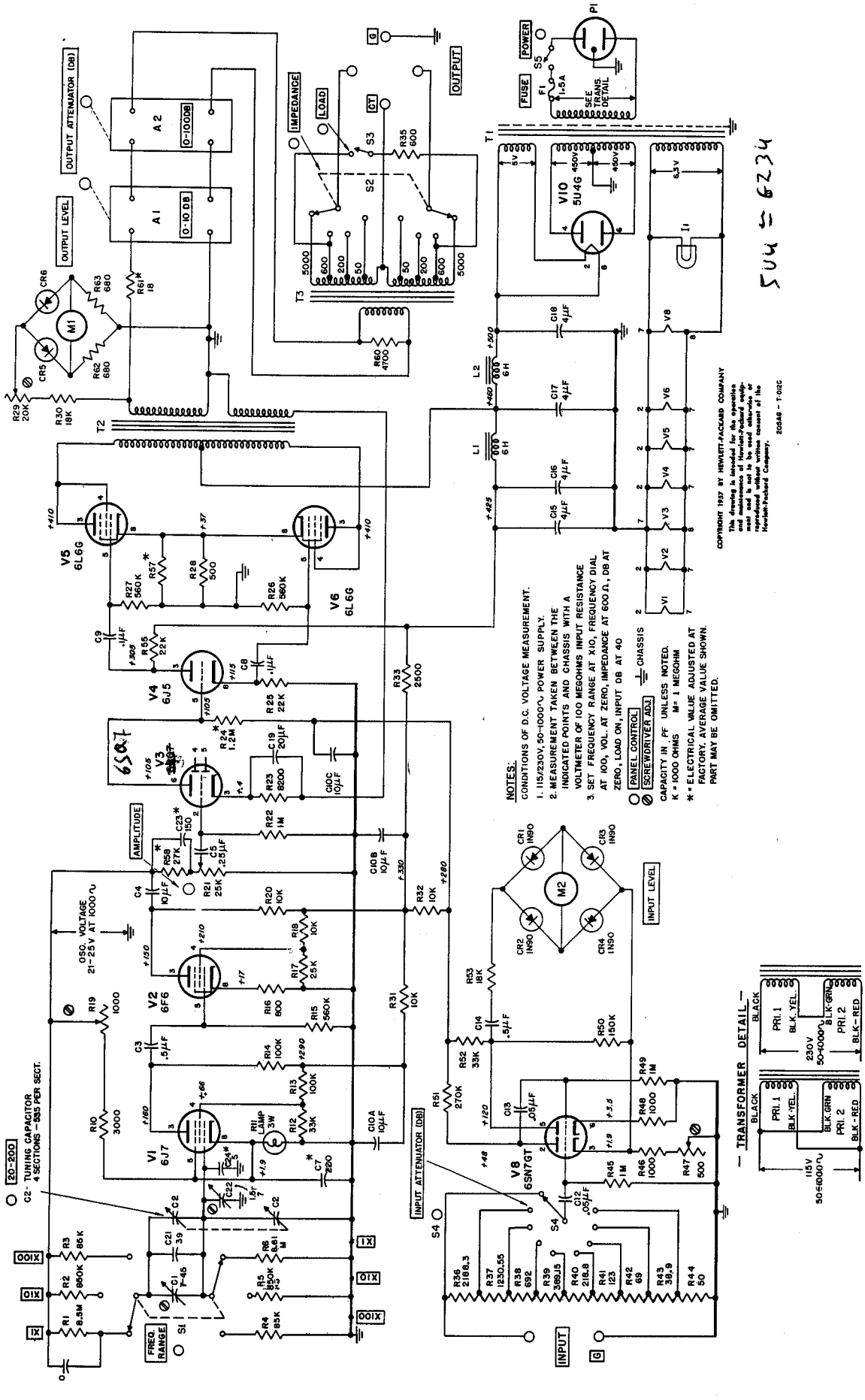


Figure 4-3. Model 205AG Audio Signal Generator

MANUAL CHANGES

MODEL 205AG

AUDIO SIGNAL GENERATOR

Manual Serial Prefixed: 012-
Manual Printed 5/61

To adapt this manual to instruments with other serial prefixes check for errata below, and make changes shown in tables.

Instrument Serial Prefix	Make Manual Changes
012	1
151	2
All	3, 4
231	5

Instrument Serial Prefix	Make Manual Changes
All	6

CHANGE #1

Paragraph 4-7, step b,
Change the setting of LOAD switch to OFF.

Paragraph 4-7, line #5 of step c,
Change to read: "diodes CR1, CR2, CR3, and CR4 should be replaced and the above adjustments repeated."

CHANGE #2

The 205AG contains two terminal boards on which are mounted a variety of small parts. The boards used in earlier instruments (24-terminal board Stock No. 2G-75A; 14-terminal board Stock No. 2G-75B) utilized solder lugs to mount parts. The boards used in later issue instruments, having serial prefix number 151-(large board Stock No. 2G-75C; small board Stock No. 2G-75D) are directly interchangeable, and the etched-circuit board will be supplied as a replacement part for both types.

CHANGE #3

Figure 4-3,
Change V3 to read, "6SQ7".

CHANGE #4

Table of Replaceable Parts
Was C19, Capacitor - fixed, 20 μfd, 50 vdc
Mfr., 37942, hp Stock No. 0180-0026, TQ-1, RS-1.

Now C19, Capacitor - fixed, 20 μfd, 50 vdc
Mfr., 56289, hp Stock No. 0180-0049, TQ-1, RS-1.

CHANGE #5

Table of Replaceable Parts
Delete the following:
Spring, Compression, Stock No. 1460-0019, 1 ea
Vernier Disc, Stock No. G-14A, 1 ea
Vernier Disc, Stock No. G-14B, 1 ea

Add the following:
Disc Ass'y Vernier Drive, Stock No. G-14J, Mfr. 28480, TQ-1
Bearing Capacitor Drive, Stock No. G-36J, Mfr. 28480, TQ-1
Spring Thrust, Stock No. G-91A, Mfr. 28480, TQ-1

CHANGE #6

Table of Replaceable Parts
Was Attenuator, output, complete hp Stock No. 2AG-34
Now Attenuator, output, complete hp Stock No. 2AG-34A

MANUAL CHANGES

MODEL 205AG

AUDIO SIGNAL GENERATOR

Manual Serial Prefixed: 012-
Manual Printed: 5/61

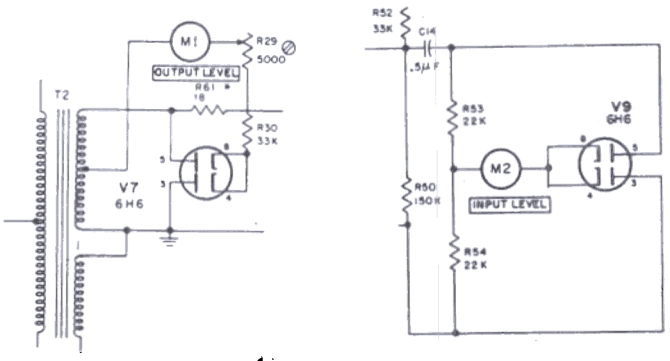
To adapt this manual to instruments with other serial prefixes check for errata below, and make changes shown in tables.

Instrument Serial Number	Make Manual Changes
8312 to 8462	1, 2
7712 to 8311	1, 2, 3
7612 to 7711	1, 2, 3, 4
6237 to 7611	1, 3, 4, 5

Instrument Serial Number	Make Manual Changes
5667 to 6236	1, 3, 4, 5, 6
4688 to 5666	1, 3, 4, 5, 6, 7
Below 4688	8

CHANGE 1

Change circuits of M1 and M2 as shown below:



R29: Change to 500 ohms, Ⓗ Stock No. 2100-0011.
R53: Change to 22K ohms, Ⓗ Stock No. 0690-2231.
Add R54: 22K ohms, Ⓗ Stock No. 0690-2231.
R62, 63: Delete
CR1 to CR6: Delete
Add V7, 9: Type 6H6 tubes.
Add R59: 7 ohm resistor, connected in series with V9, heater pin 7.

CHANGE 2

R30: Change to 27.5K ohms, Ⓗ Stock No. 0730-0048.

CHANGE 3

I1: Change to GE-47 lamp, Ⓗ Stock No. 2140-0009.
Add R56: 33 ohms resistor in series with I1.
Lens: Change Ⓗ Stock No. to 1450-0026.
Lampholder: Change Ⓗ Stock No. 1450-0027.

CHANGE 4

C19: Change to 1000 pf.
R61: Change to 100 ohms.

6/8/62 - BD

(over)

Instrument Serial Number	Make Manual Changes
8312 to 8462	1, 2
7712 to 8311	1, 2, 3
7612 to 7711	1, 2, 3, 4
6237 to 7611	1, 3, 4, 5

Instrument Serial Number	Make Manual Changes
5667 to 6236	1, 3, 4, 5, 6
4688 to 5666	1, 3, 4, 5, 6, 7
Below 4688	8

CHANGE 5

R30: Change value to 25.2K ohms.
C19: Change to 1000 pf.
R4: Change to 82,500 ohms.
R5: Change to 825K ohms.
R6: Change to 8.35 M.
Add R7: 5000 ohm potentiometer between R4 and ground.
Add R8: 50K ohm potentiometer between R5 and ground.
Add R9: 500K ohm potentiometer between R6 and ground.
R24: Change to 1.2M.
R58: Change to 39K ohms.
R61: Delete
S1: Change (P) Stock No. to 2AG-19W.

The range switch resistors R1 to R6 inclusive and the individual range adjustment potentiometers R7 to R9 inclusive in conjunction with the tuning capacitor assembly C1 and C2, determine the frequency of the oscillation of the unit and also affect the amplitude. If the output frequency is not within 2% of that indicated by the dial, or if the amplitude varies more than ±1/2 db from 200 to 2000 cps, the following procedure is recommended:

IMPORTANT

For all adjustments the output must be loaded with the internal load. Turn panel load Switch ON. The panel meter is used for voltage measurements in this procedure.

The frequency calibration will be correct only when the shields around and above the main tuning capacitor are firmly in place.

Blow out any dust that may be present on the tuning capacitor. Use a gentle air stream.

1) Check for proper setting of dial on shaft. At one end of the frequency dial will be either a small dot or an extra line. This should be under the indicator hairline when the tuning capacitor is at that end of its travel. This may be adjusted by loosening set screws on one side of the coupler behind the panel, then rotating the dial until correctly lined up.

Check and tighten all set screws in the dial drive mechanism.

2) Turn on instrument and allow at least 30 minutes for it to warm up.

3) Set to X10 range and dial to 20. Set the X10 adjustment potentiometer R8 so that the frequency is exactly 200 cps. Set the output meter to 50 volts. Change dial setting to 200. The panel output meter should then read 50 volts ± 2 volts and the frequency and amplitude are in error, adjust C1 for the best compromise between correct frequency and correct amplitude.

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Instrument Serial Number	Make Manual Changes
8312 to 8462	1, 2
7712 to 8311	1, 2, 3
7612 to 7711	1, 2, 3, 4
6237 to 7611	1, 3, 4, 5,

Instrument Serial Number	Make Manual Changes
5667 to 6236	1, 3, 4, 5, 6
4688 to 5666	1, 3, 4, 5, 6, 7
Below 4688	8

CHANGE 5 (cont.) If instrument does not have control R8, set dial to 20. To correct error in frequency and amplitude, adjust trimmer C1 for best compromise of frequency and amplitude. If instrument also has trimmer C22, adjust C1 and C22 alternately so frequency is 2000 cps and amplitude is 50 volts.

4) Check tracking of the rest of the frequency dial. If there is no constant error in tracking, proceed with the next step. If there is a constant error, proceed with one of the following methods a, b, or c, whichever is the easiest.

a. Loosen the set screws and reset the dial to take the error into account, then repeat steps 2 and 3. This method is best if the other ranges also have a constant error in the same direction.

b. Change the setting of range switch adjustment R8. If a greater change is necessary than can be obtained by changing the potentiometer R8, change the small padding resistors in series with the precision resistor on the range switch. Increasing the value of the resistor by 10,000 ohms will lower the frequency of the range approximately 1%; decreasing the value of this resistor will raise the frequency of the range.* Retrace steps 1 through 4.

c. If on the X10 range there is not more than 1% or 2% error in tracking across the dial, this may be corrected by bending the split rotor plates on the tuning capacitor C2.

Reset dial for best tracking to lowest possible dial point, then adjust calibration of the dial points which do not track by bending outer rotor plates of the tuning capacitor.

Attempt to bend the plates in each section by the same amount. When bending capacitor plates, it is necessary to remove the top shield to bend the plates and then to replace it after each bending operation. The instrument changes frequency when the shield is removed.

5) When the X10 range has been properly adjusted, the other ranges may be adjusted as follows:

a. X100 range. Adjust potentiometer R-7 to make 2000 cycles on the dial read correctly. If this potentiometer does not give sufficient range, it may be necessary to change the padding resistor in series with the precision resistor. A change of 1000 ohms will change the frequency approximately 1% in this range.

(over)

Instrument Serial Number	Make Manual Changes
8312 to 8462	1, 2
7712 to 8311	1, 2, 3
7612 to 7711	1, 2, 3, 4
6237 to 7611	1, 3, 4, 5

Instrument Serial Number	Make Manual Changes
5667 to 6236	1, 3, 4, 5, 6
4688 to 5666	1, 3, 4, 5, 6, 7
Below 4688	8

CHANGE 5 (cont.) Then 20,000 cycles on the dial is corrected by varying C-7. A change of 50 to 200 pf is usually adequate. For instruments without controls R7 and R9, adjust series pads of range resistors.*

b. X1 range. Adjust potentiometer R-9 to make the dial read correctly at 100 cycles. If the potentiometer does not give sufficient range, it may be necessary to change the padding resistor. An increase of 100K ohms will decrease frequency approximately 1% on this range. There may be a small tracking error (less than 2%) at the top or the bottom of the X1 range. This is normal to the instrument and cannot be eliminated. For instruments without controls R7 and R9, adjust series pads of range resistors.*

6) If satisfactory calibration cannot be obtained in the above manner, it is necessary to return the instrument to the factory.

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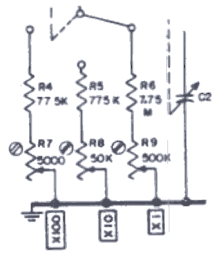
* Up to 1% change in frequency on any range may be made by adjusting only one of the two range resistor padders on that range. If a greater frequency change is needed, adjust both padders. If this is not done, the relative amplitude between ranges will be affected.



CHANGE 6 C20, 21, 22: Delete

CHANGE 7 T1: Change ℄ Stock No. to 910-11

CHANGE 8 For instruments having serials below 4688, refer to the following two schematic diagrams for additional changes, such as the values of frequency range resistors, phase inverter circuit of V3 and V4, and input voltmeter circuit.

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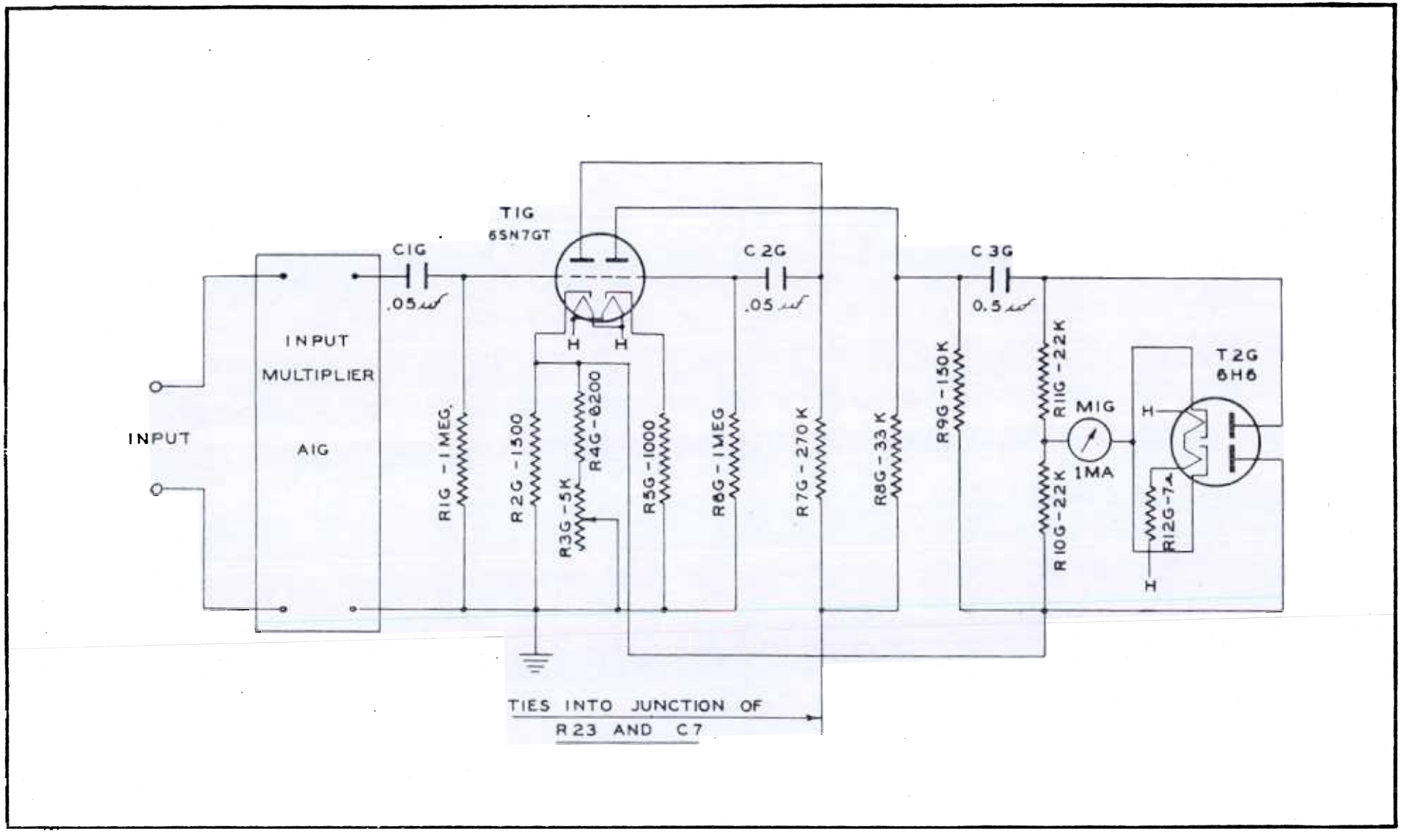
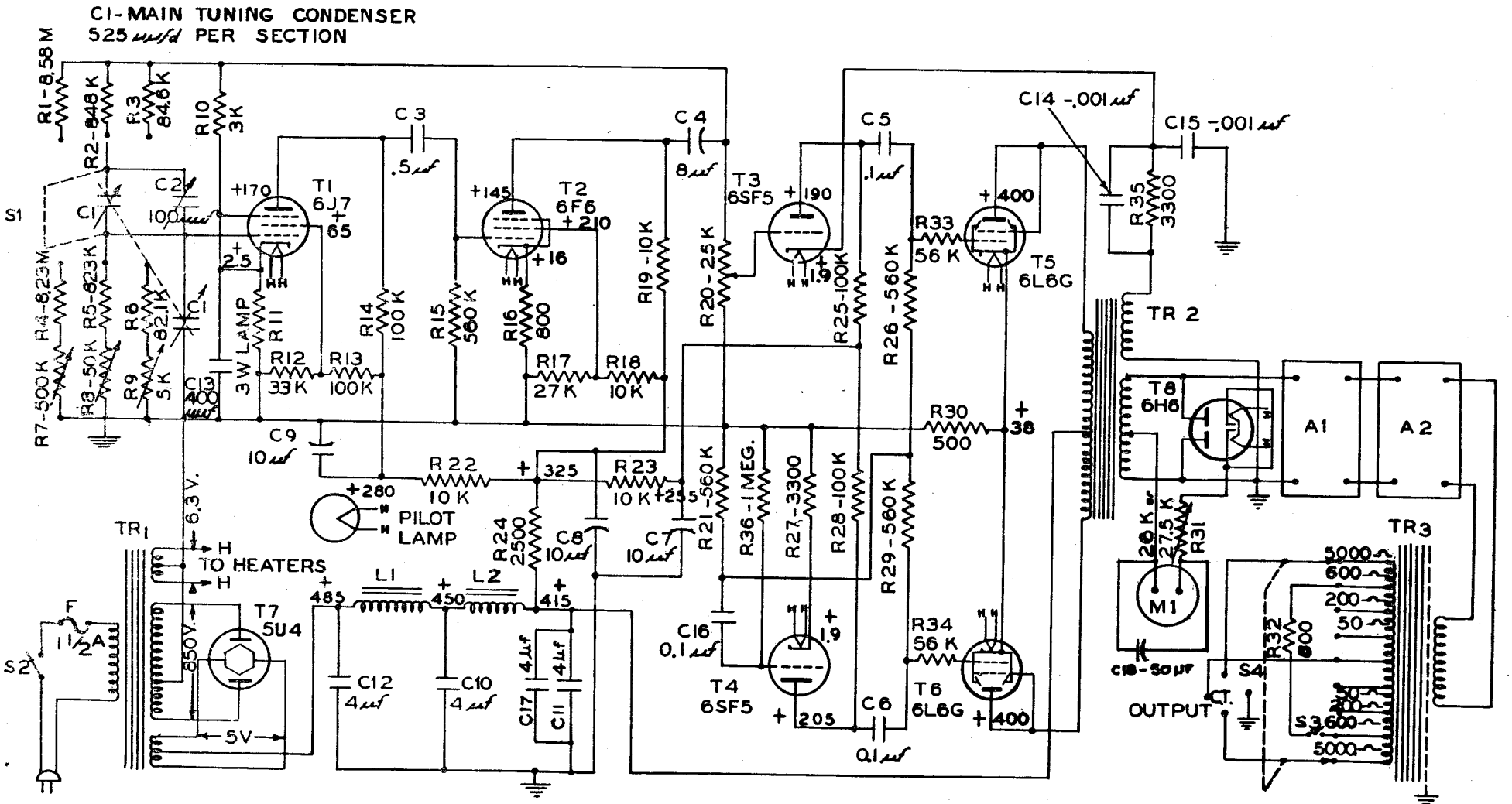


Schematic Diagram for Input Voltmeter Model 205AG (BD)



ALL DC MEASUREMENTS MADE WITH VOLUME CONTROL SET AT ZERO

SCHEMATIC DIAGRAM OF -HP- MODELS 205A AND 205AG AUDIO SIGNAL GENERATOR