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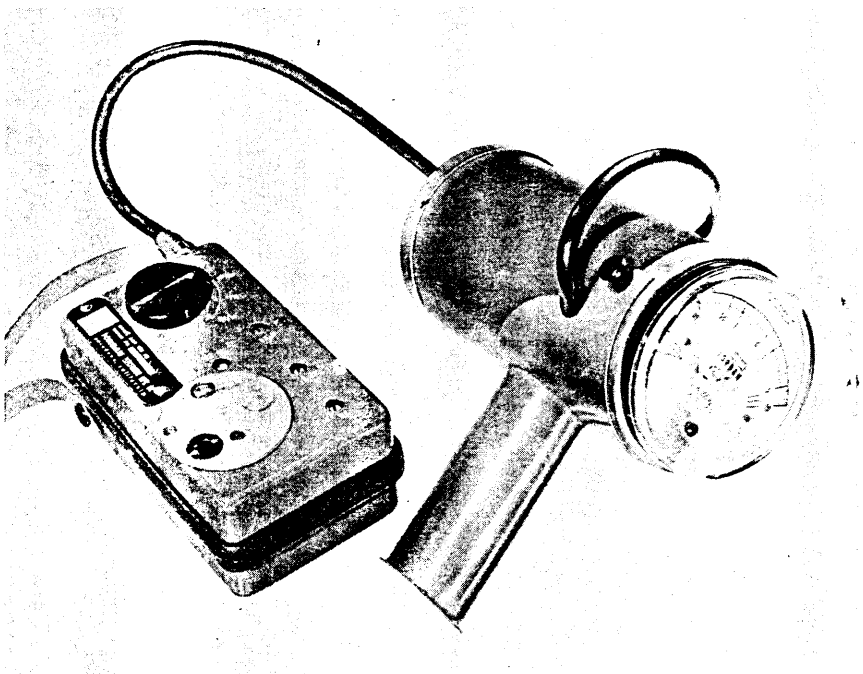
OPERATING AND MAINTENANCE INSTRUCTIONS



RADIATION SURVEY METERS
MODELS AGB-1-SR, AGB-10-SR
and AGB-10K-SR

Jordan Electronics, Inc.

PASADENA CALIFORNIA

OPERATING AND MAINTENANCE
INSTRUCTIONS

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MODELS AGB-1-SR,, AGB-10-SR
and AGB-10K-SR

JORDAN ELECTRONICS, INC.
119 East Union Street
Pasadena 1, California

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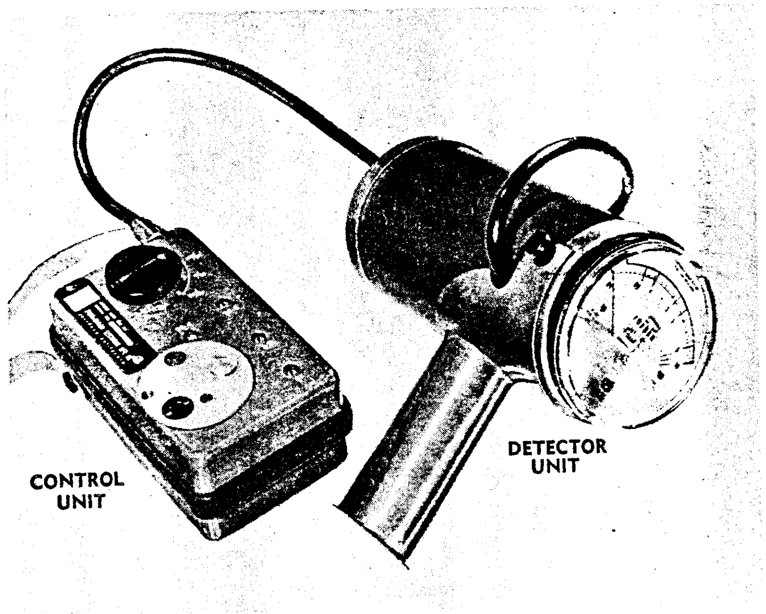


Figure 1
Model AGB-10K-SR

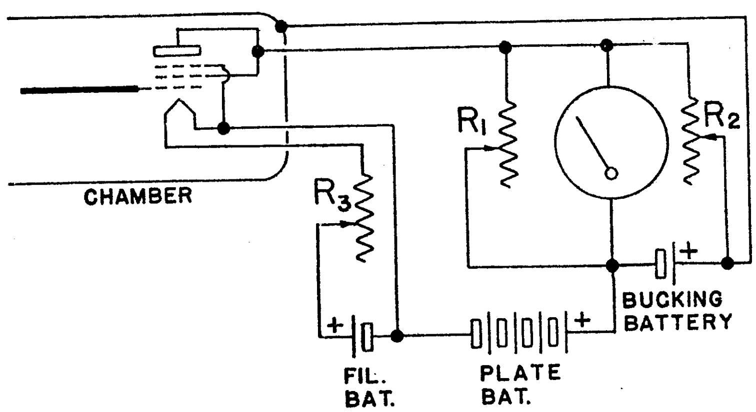


Figure 2
Basic Circuit

OPERATING AND MAINTENANCE INSTRUCTIONS

1.0 GENERAL DESCRIPTION

1.1 PURPOSE: The Model AGB-10-SR is a highly sensitive portable instrument for use in health monitoring, food and water monitoring, and other measurements of radiation at near background levels. Two three-decade ranges give readings from 0.01 mr/hr to 10 mr/hr and 0.01 r/hr to 10 r/hr. It is easy to detect a change of as little as .002 mr/hr at levels near background. Where even greater reading accuracy is required the scales can be reduced to two decades to read from 0.01 mr/hr to 1.0 mr/hr and 1.0 mr/hr to 100 mr/hr. This, however, eliminates the convenience of using the same calibrations for both milliroentgens and roentgens.

Where it is desirable to cover the entire useful range of intensities with a single instrument, three ranges are provided with three decades each, and the calibration is thus extended to 10,000 r/hr. Although this level is higher than that at which a portable instrument would be purposely used except in emergencies, the 500 r/hr point is more than half way up the scale, and no reading accuracy is sacrificed for the extended range.

This one instrument will do the work of a Geiger counter, a medium level, and a high level survey meter.

Three models are available as follows:

Model AGB-1-SR: 2 ranges, 0.01 to 1 mr/hr and 1 to 100 mr/hr

Model AGB-10-SR: 2 ranges, 0.01 to 10 mr/hr and 0.01 to 10 r/hr

Model AGB-10K-SR: 3 ranges, 0.01 to 10 mr/hr and 0.01 to 10 r/hr and 10 to 10,000 r/hr

1.2 THE BASIC CIRCUIT

The basic circuit used in the instrument is quite simple as illustrated in Figure 2.

The plate current of the 5886 flows through the meter shunted by R_1. A bucking current flows through R_2 and is adjusted to balance out the plate current at the lowest value of radiation to be read on the scale.

The filament voltage is adjusted by R_3 to a value that produces the greatest stability in plate current over the life span of the filament battery. The shell voltage in this basic circuit is obtained from the bucking line.

This instrument is based on the Neher-White Ionization Chamber. The configuration of the chamber in this Portable Radiation Monitor is shown in Figure 3.

1.3 CONSTRUCTION OF NEHER-WHITE IONIZATION CHAMBER

The Neher-White Ionization Chamber is essentially a steel shell with a 5886 electrometer tube sealed inside at ten atmospheres of pure argon. The grid of the electrometer tube is connected only to the ion collector, and the insulation resistance is maintained above 10^{15} ohms. In this floating grid circuit the positive ionization current from the collector balances the negative electron current from the filament, and the plate current is a logarithmic function of the ionization current. The plate current change is 10-15 μa. per decade change in radiation.

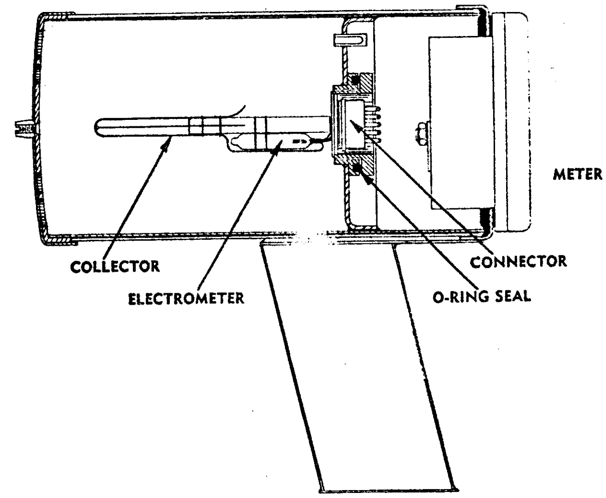


Figure 3
Detector Unit

1.4 CHARACTERISTICS OF NEHER-WHITE CHAMBER

The Neher-White Ionization Chamber differs from ordinary ionization chambers in the following respects:

1. The output current from the chamber drives the indicating meter directly without requiring intermediate amplification.
2. Logarithmic current output is obtained directly.
3. Argon under high pressure is used instead of air atmospheric pressure to increase ionization chamber efficiency. Since ionization current for a given radiation is directly proportional to the mass of gas present, higher output current is obtained. The larger mass of gas present also results in a lower temperature coefficient since the percentage of contaminate molecules remaining in the chamber after baking and evacuation is smaller.
4. The electrometer tube is sealed in the chamber with the grid connected only to the ion collector. All other leads going outside the chamber are low impedance minimizing insulation requirements in the instrument.

5. The chamber is of all-metal construction and sealed with silver solder. This type of construction enables the instrument to withstand considerable abuse.
6. The steel chamber wall increases gamma and X-ray efficiency by producing more "secondary" or Compton electrons than an air equivalent chamber wall.

2.0 THEORY OF OPERATION

2.1 IONIZATION CHAMBER THEORY

The simple circuit and operation of these instruments is based on the use of the Neher-White ionization chamber as the radiation sensing element. This chamber is a steel shell containing an insulated "ion" collector attached to the grid of an electrometer tube. When radiation such as X-rays or gamma rays pass through this steel shell, "secondary" or Compton electrons are knocked out of the inside shell walls. These Compton electrons collide with the argon gas molecules inside the chamber. During collision some gas molecules lose electrons and become positively charged ions. Beta rays, on the other hand, entering the chamber form positively charged ions directly without formation of intermediate Compton electrons.

By applying a positive voltage to the shell, making the collector negative with respect to the shell, the positive ions, formed by radiation, flow to the collector. These positive ions flow along the collector to the grid of the electrometer tube making the grid less negative resulting in an increase in tube plate current. This plate current flows directly to a meter indicating the radiation at the chamber.

2.2 THEORY OF LOGARITHMIC RESPONSE

While the construction of the Neher-White Ionization chamber greatly simplifies instrument circuitry, the connection of the grid only to the collector also results in logarithmic response. This logarithmic response of tube plate current for radiation intensity can be shown in the following manner:

An electron current i_0 is emitted by the filament. Only a portion of these electrons have sufficient energy to reach the grid plane. This current i is given by

$$i = i_o e^{\frac{E_g}{E_e}} \qquad (1)$$

where E_g is the voltage of the grid, and E_e is the mean kinetic energy of the thermal electrons emitted by the filament. (This is about .08 volts.) Base of natural logarithms $e = 2.7183$.

Of these electrons only a small portion strike the grid wires. This is the current that balances the ion current I from the collector. It is

$$I = i_g = k i_o e^{\frac{E_g}{E_e}} \qquad (2)$$

where k is a constant determined by the geometry of the tube and i_g is the grid current.

Although the potential E_g of the grid wires is negative with respect to the filament, the grid plane potential E is positive because of the positive potential of the screen grid. The grid plane potential is

$$E = E_g + \frac{E_p}{\mu} \tag{3}$$

where μ is the amplification factor and E_p the plate voltage of the tube. The tube is triode connected so the portion of the electron current that passes through the grid to the elements beyond is i_p. In this mode of operation i_p is related to E by the factor g_m.

$$i_p = g_m [E_g + \frac{E_p}{\mu}] \tag{4}$$

where g_m is the mutual conductance of the tube, and i_p is the combined current of the elements beyond the grid.
By combining equations 2, 3 and 4 we find that

$$i_p = g_m E_e [\ln I - \ln k i_o] + \frac{E_p}{\mu} g_m \tag{5}$$

Since k, i_o, μ, g_m, E_e and E_p are constants, this shows that the plate current of the tube is a logarithmic function of the positive ion current.

3.0 ENERGY DEPENDENCE

3.1 RADIATION ENERGY

Radiation energy is generally defined as the kinetic energy of a particle or wave with an assigned mass moving at a certain velocity. The kinetic energy of radiation is customarily expressed in "electron volts" which is the ratio of kinetic energy to the gain in kinetic energy of a single electron acted upon by an electrical field force of one volt. Since nuclear processes liberate radiation of relatively high energy levels the energy of radiation waves or particles is expressed in mev (million electron volts) and kev (thousand electron volts). X-ray energies are customarily referred to as "effective energies" which are the same as "kev" electron volts.

3.2 THE RADIATION ENERGY DEPENDENCE STANDARD

The relative energy response of any ionization chamber to radiation of the same intensity but of different energies has been arbitrarily compared to the ionization produced in a unit volume of air. The relative ionization of different energies in this air equivalent chamber are then related to the ionization produced in any specific substance under consideration. health monitoring, for instance, the ionization produced by different energies and types of radiation in human skin is the ultimate goal.

3.3 ENERGY DEPENDENCE OF THE NEHER-WHITE IONIZATION CHAMBER

The usual "air equivalent" ionization chamber is constructed of plastic having an average atomic number close to that of air. These chambers are not as rugged as a metal chamber and are subject to damage.

The Neher-White ionization chamber has a steel wall. The response to different energies is compensated by covering the steel with a thin sheet of lead.
This construction provides response essentially independent of the energy of the gamma radiation from 80 kev to 1.3 mev. The response is about 10% high at 250 kev and drops off sharply below 70 kev.

4.0 OPERATION AND FIELD MAINTENANCE

4.1 DESCRIPTION

The information presented in this section is for normal operation and field maintenance. Instrument calibration and battery condition can be checked directly with the instrument. However, to keep the instrument in optimum operating condition, laboratory calibration is recommended at least every six months. If instrument is to be used without laboratory calibration for long periods of time, remember that the 25 year half life of the Sr^{90} calibration check source results in a radiation decrease of 5.5% every two years.

4.2 HOW TO USE INSTRUMENT

(a) Place shoulder strap of Control Unit over the shoulder. Hold detector unit by pistol grip handle (this assembly may also be carried on a shoulder strap or on the belt with holster provided).

(b) Turn control knob to "Test" positions 1, 2 and 3 to check condition of batteries. Meter should indicate in "test" area at high end of meter scale for all three positions.

(c) Turn control knob *past* "Test" positions to radiation range required, mr/hr, r/hr, etc.

(d) Instrument is ready to measure radiation after two minute "warm up".

4.3 TO MEASURE RADIATION

(a) Measure gamma radiation with beta shutter shown in Figure 4, covering beta windows. Gamma radiation intensity is indicated directly on logarithmic meter scale. (See section 7.1 to read logarithmic scale).

(b) Measure beta radiation in the presence of a gamma field by opening beta shutter shown in Figure 4, exposing beta windows. Multiply reading increase due to beta radiation by 10 to obtain beta reading.

4.4 TO TAKE READINGS WITH THE METER 20 FEET FROM THE CHAMBER

(a) Remove meter and handle assembly from chamber as shown in Figure 4, (see sections 6.3 (a) 1 and 2).
(b) Slide wire reel away from back of meter.
(c) Remove twisted cable from holding slot and unwind.
(d) Replace empty reel in back of meter and separate meter and handle from chamber.

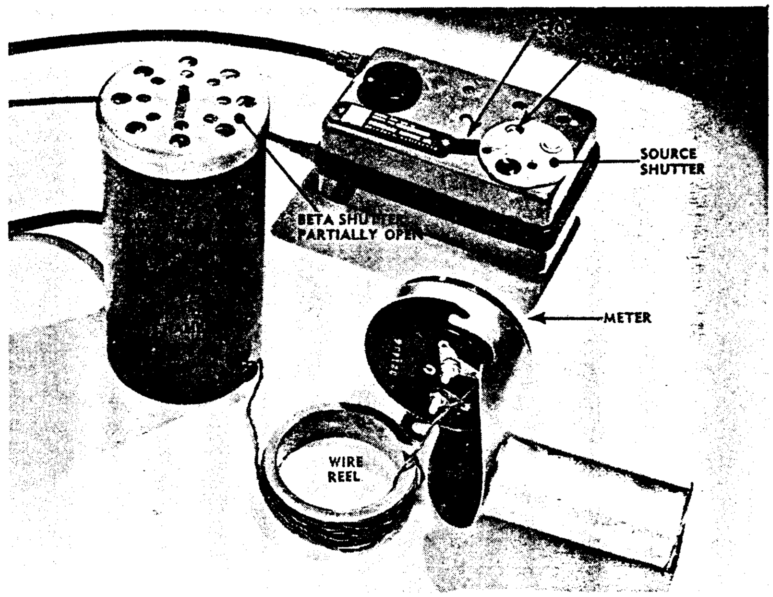


Figure 4
Chamber Removed For Remote Use

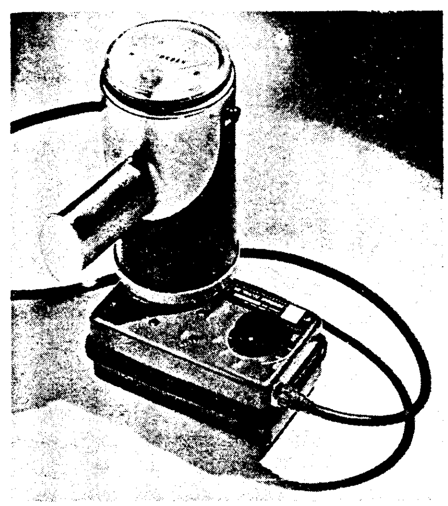


Figure 5
Set-up for Calibration Checks

4.5 TO CHECK CALIBRATION

(a) Place control unit on flat level surface.

(b) Rotate source shutter on control unit to its clockwise stop and engage lock. The sealed source will be visible through the largest hole in the shutter. Do not touch the source.

(c) Rotate beta shutter on detector unit to expose beta windows.

(d) Insert black stud on beta shutter into black well in source shutter on control unit. DO NOT PLACE STUD IN SOURCE OPENING.

(e) Turn detector unit around until pistol grip is over space between B1 and B2. The detector unit will now balance on the control unit as shown in Figure 5. The raised button on the source shutter must be engaged in an opening in the beta shutter on chamber.

(f) Set control knob to range 1 (mr/hr). Meter should read 10 mr/hr (full scale). If not, adjust B1 to obtain this reading.

(g) Set control knob to range 2 (r/hr). Meter should read .01 r/hr (bottom scale). If not, adjust B2 to obtain this reading.

NOTE: THE FOLLOWING STEPS PERTAIN TO MODEL AGB-10K-SR ONLY.

(h) Set control knob to position 3-A. Adjust B3-A to make meter read exactly 10 (full scale).

(i) Set control knob to position 3-B. The meter should read bottom scale (.01). If not, adjust B3-B to obtain this reading.

(j) Remove detector unit from control unit and CLOSE SOURCE SHUTTER.

NOTE: THE FULL SCALE READING FOR THE MODEL AGB-1-SR IS 1.0 mr/hr. WITH THIS EXCEPTION, THIS MODEL IS CHECKED AS DESCRIBED IN STEPS (a) THROUGH (g) ABOVE.

4.6 TO CHECK BATTERIES

(a) Set control knob to position 1 (Filament Battery Check), position 2 (Plate Battery Check), position 3 (Shell Battery Check).

(b) If the meter reads below the "Test" mark, the batteries in the position indicated are weak and should be replaced as soon as possible.

4.7 TO REPLACE BATTERIES

(a) Remove back cover of control unit by unscrewing screw in center of back side of control unit until it is loose in hole. A key, coin or knife can be used.

(b) Pull gently on back half of control unit until back side separates from black neoprene gasket.

(c) Remove and replace batteries as indicated in section 4.5(a). Battery positions are shown in Figure 6. Mercury batteries must be removed negative end first. They can be pried out with a knife, key or screwdriver.

(d) Check battery clip compression and contact surfaces in accordance with section 6.5(a).

(e) Replace back half of control unit and tighten screw.

(f) Both halves of control unit should seat firmly in neoprene gasket.
NOTE: See section 7.5, page 22 for battery types.

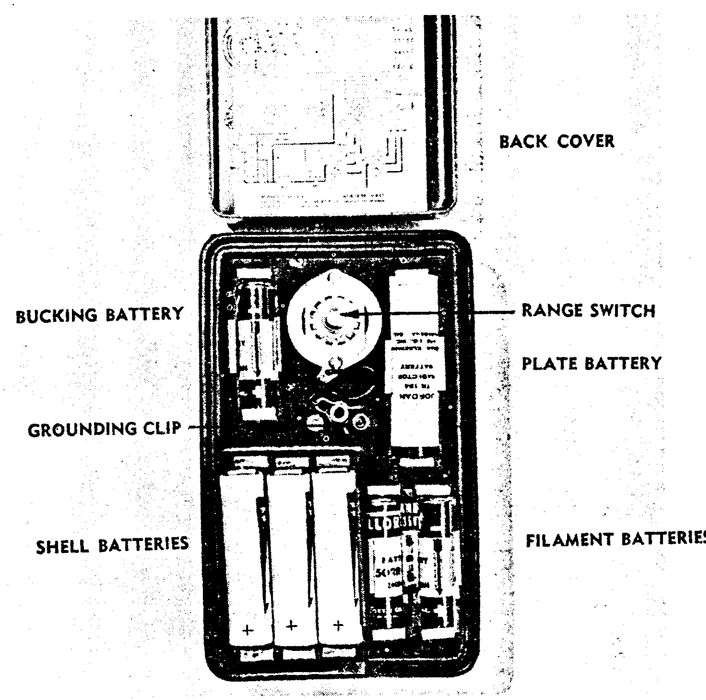


Figure 6
Control Unit Open for Access to Batteries

5.0 INSTRUCTIONS FOR LABORATORY CALIBRATION

If the field procedure outlined in section 4.0 does not bring instrument back into calibration, the instrument should be calibrated as described below.

5.1 EQUIPMENT REQUIRED

1. Calibrated gamma source
2. Calibrated scale

5.2 RECOMMENDED METHOD OF SETTING UP RADIATION INTENSITY VS. DISTANCE FOR A GIVEN SOURCE

The distance for radium or cobalt is given by the following:

$$D = \sqrt{\frac{2.01 \times A}{r/hr}} \qquad D = \sqrt{\frac{1.3 \times A}{r/hr}}$$

Cobalt 60 Formula — Radium Formula

Where r hr=radition intensity in roentgens per hour

A=strength of radioactive source expressed for radium in milli-grams or millicuries; for cobalt, 60 in millicuries.

D=distance (inches) between central axis of detector unit (axis as shown in Figure 7) should be perpendicular to calibration bench.

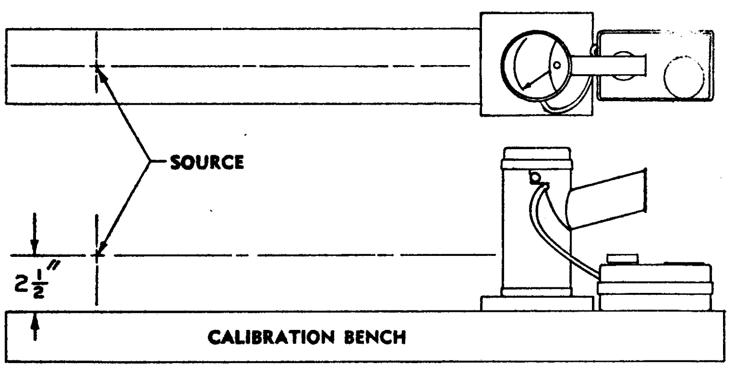


Figure 7

Laboratory Calibration Set-up

As these formulas show, the intensity decreases as the square of the distance from the source. A plot of this function on full logarithmic paper will be a straight line showing one decade decrease in radiation in-tensity for each two decade increase in distance. Thus, the required calibration data can be obtained by calculating only one point from the formula and drawing through it a straight line with the proper slope. A typical plot is shown in Figure 8.

Since these equations are precise only for a point source and an infinitely small chamber, do not use the source at distances less than 10 inches unless it has been specially calibrated for this size chamber.

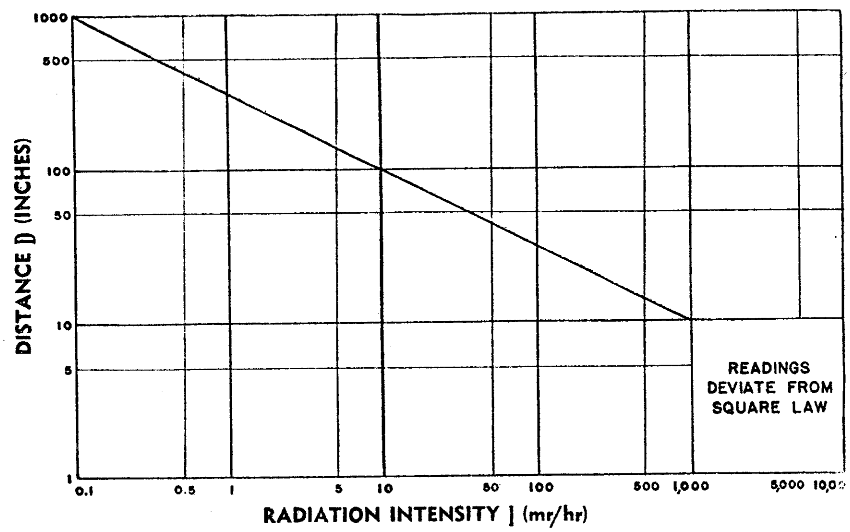


Figure 8

Sample Calibration Curve

5.3 ADJUSTING THE Sr^{90} CALIBRATION CHECK SOURCE

(a) Turn instrument OFF and remove top and bottom cover (see section 6.3). Replace control knob and set detector unit in upright position according to step 5.4(a).

(b) Place the calibrated gamma source at the 10 mr/hr distance according to step 5.4(h).

(c) Set control knob to Range 1 (fourth position from "OFF") and adjust B1 to make meter read exactly 10.

(d) Remove gamma source and place detector unit on control unit cover in the manner described in section 4.5.

(e) If the check source produces a reading other than exactly 10 mr/hr unscrew the threaded plug from the source holder inside the control unit cover and use a screwdriver to adjust the source. Turn clockwise to increase the reading.

(f) Replace plug and tighten to lock source adjustment. Re-assemble control unit.

5.4 LABORATORY CALIBRATION PROCEDURE

(a) Support detector unit in upright position as shown in Figure 7.

(b) With control knob in OFF position, adjust meter pointer to exactly .01 using screw on meter face.

(c) Check batteries in accordance with section 4.3. Batteries must all check "good" before calibrating.

(d) Set control knob to Range 1 (mr/hr) and allow instrument to warm up for 10 minutes.

(e) Lock source shutter on control unit in OPEN position.

CALIBRATION OF mr/hr RANGE

(f) Read background level with no source present. This will usually be between .01 and .02 mr/hr.

(g) Place source at distance to give an intensity of .05 mr/hr at detector. Adjust B1 to make meter read (.05+background.) This reading is usually between .06 and .07 mr/hr.

(h) Move source to the distance for 10 mr/hr. Adjust S1 (visible through hole in source shutter and opposite B1) to make meter read 10 mr/hr.

(i) Adjusting S1 may affect the B1 adjustment. Repeat steps (g) and (h) until the adjustment is correct.

(j) Remove source and check the background reading. If it differs greatly from the original estimate, use the new reading and repeat steps (f) through (h).

CALIBRATION OF r/hr RANGE

(k) Set control knob to Range 2 (r/hr). Move source to the 10 mr/hr position (.01 r/hr).

(l) Adjust B2 to make meter read .01.

(m) Move source to the 10 r/hr position. Adjust S2 (above S1) to make meter read 10.

(n) Re-check steps (k) and (l) and re-adjust if necessary.

CALIBRATION OF Kr/hr RANGE

The procedure for calibrating Range 3 (Kr/hr) is similar to that for Range 2 except that a very large source (or one specially calibrated) is required to check the high intensities. The 10 r/hr (.01 Kr/hr) point can be checked with the source in the 10 r/hr position (step 1 above) and B3-B adjusted if required.

6.0 SERVICING

6.1 GENERAL

Servicing is required if these instruments operate improperly after all the steps in section 4.0 have been followed. Before beginning trouble-shooting the wiring diagram in Figure 11 should be thoroughly understood. Even though these instruments are simple in theory and construction, major repair should be undertaken only by qualified electronic technicians and service men.

6.2 WIRING DIAGRAMS

The wiring diagram in Figure 11 below covers Models AGB-10K-SR, AGB-10-SR and AGB-1-SR. Components used only in Model AGB-10K-SR are shown in dotted lines.

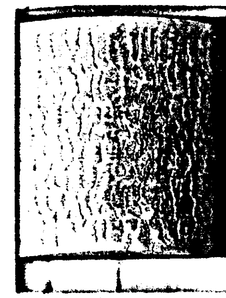
The symbols used to identify the components appear on the printed circuit boards adjacent to the components and are identical to the symbols shown in the wiring diagram.

6.3 INSTRUMENT DISASSEMBLY

The instrument should be in "off" position before proceeding with disassembly.

(a) Detector unit disassembly as shown in Figure 4 (page 8).

1. Holding handle in right hand at waist level, grasp center of



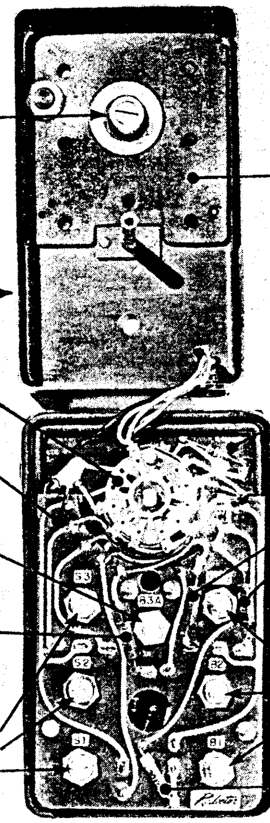


Figure 9

Control Unit Open for Access to Calibration Resistors

chamber with left hand and turn counter-clockwise until the chamber wall studs disengage from sheet metal hooks.

2. Separate meter and handle from chamber being careful not to break twisted wire connecting meter to chamber.

3. To remove the meter, remove the wire spool and rubber gasket on the back of the meter and remove the three screws holding the meter in its mounting ring.

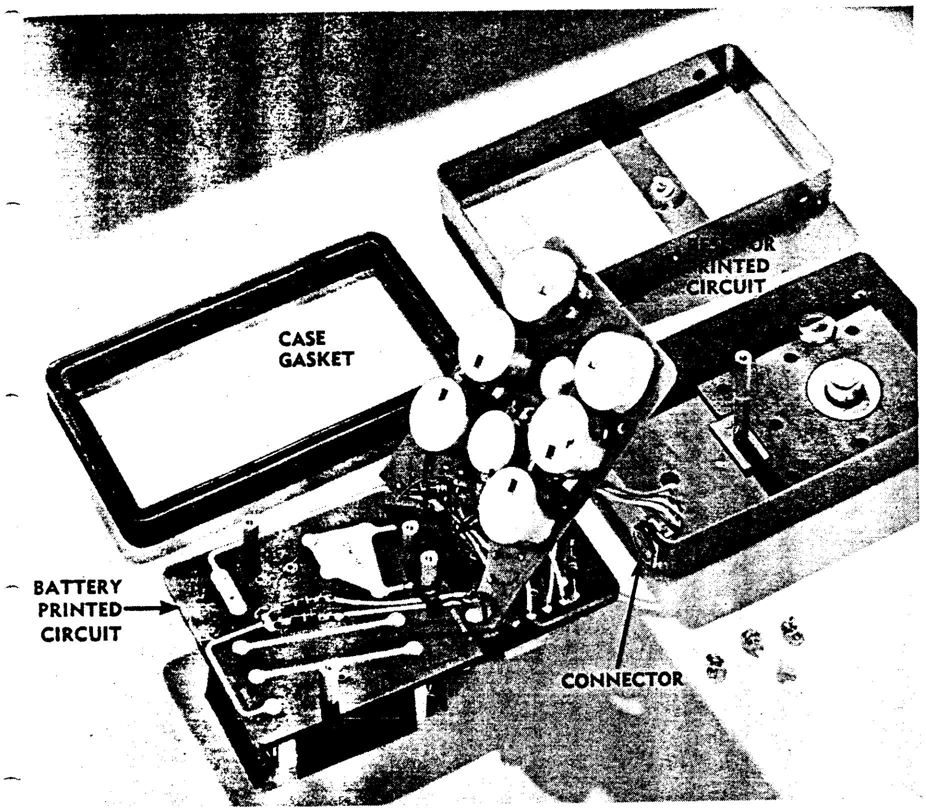


Figure 10

Control Unit Disassembled for Servicing

(b) CONTROL UNIT DISASSEMBLY AS SHOWN IN FIGURES 6, 9 AND 10 (pages 10, 14 and 15).

1. Remove back cover of control unit by unscrewing screw in center of back side until it is loose in hole.
2. Pull gently on back half of control unit until back side separates from black neoprene gasket.
3. Remove front cover by disengaging grounding clip connected to black ground wire from the internally threaded stud in center of batteries and loosening Control Knob with Allen wrench.

4. Holding black neoprene gasket in one hand, use other hand to pull gently on front cover until separation occurs, exercising care not to break wires soldered to external connector.
5. Remove resistor printed circuit assembly by removing four screws on printed circuit plate noting screw next to shunt S1 is counter sunk and must be replaced correctly. Resistor printed circuit may be lifted to permit access to printed circuit underneath, taking care not to break wires attached to switch deck.

6.4 ISOLATION OF MOST PROBABLE FAULTS

The chart below summarizes the most commonly encountered trouble symptoms, and the probable location of the faults. To perform corrective procedures sections 6.3 and 6.5 should be consulted.

TROUBLE SHOOTING CHART

SYMPTOM	PROBABLE LOCATION OF FAULT	CORRECTIVE PROCEDURE
1. Meter reads 0.01 in all battery check positions	Shielded cable shown in Fig. 4 has broken wire in 5 pin male connector.	Unscrew top of connector and resolder broken lead.
	Twisted pair conductor in Fig. 4 has been cut in re-assembly of detector unit.	Connect unbroken por[illegible] twisted pair conducto[illegible] meter or replace entire l[illegible] of conductor.
	Meter is open.	Replace Meter.
	Switch Assembly SR-0003.	Check and clean switch con- tacts with carbon tetrachloride.
2. Meter will not read full scale on mr/hr range with B1 full clockwise	Dead batteries.	Carefully check voltage of all batteries.
	No shell voltage.	Measure voltage from common negative point on printed circuit to chamber shell (any metal part of detector unit). (See Fig. 10.) If batteries are good but no shell voltage, look for shorts inside rear of detector unit.
	Plate circuit shorted.	Check resistance between meter terminal with blue lead attached and inside of shell. Unplug control unit connector first. Resistance of less than 10 megs indicates short.

	Bucking resistor R1, should be replaced (see Fig. 9).	Unsolder R1. Replace R1 with decade resistance box. Center B1. Adjust decade resistance box until background reading is obtained. Replace decade resistor box with deposited carbon resistor of same value. Recalibrate as described in section 5.
	Chamber is damaged.	If R1 has been replaced as described above and symptom is still present chamber should be replaced.
3. Meter pulsates or drifts excessively mr/hr range	Grounding Clip OFF (shown in Fig. 6).	Connect grounding clip in control unit (see section 6.3).
	Battery clips loose (shown in Fig. 6).	Tighten battery clips as described in section (6.6a).
	Glass chamber seal dirty.	Brush glass seal clean with alcohol, or carbon tetrachloride. Glass seal is exposed by pulling tube socket referred to in section 6.6b away from chamber.
4. Meter reads high and bucking potentiometer has no control	Bucking battery dead.	The test positions do not check the bucking battery. Check this battery with a voltmeter. The voltage should be 1.34 V. If not, replace battery.
	Bucking potentiometer open.	Check bucking potentiometer B1 for mr/hr range; B2 for r/hr range.
5. Meter reads high and shunt potentiometer has no control	Plate circuit shorted to filament or shell.	Follow circuit diagram in Figure 11 and trace out short.
	Shunt potentiometer open.	Check shunt potentiometer S1 for mr/hr range; S2 for r/hr range.

6.5 GENERAL TROUBLE SHOOTING CHECKS

(a) Clean and check compression of battery clips. Remove batteries, (see section 6.2 (b), steps one and two) if battery leak discharge is visible on battery ends, and wipe battery ends clean. If battery clips are corroded on contact surface, wipe clean and polish with Crocus cloth or fine emery paper. Replace batteries and try to roll or move them when clipped into position. If batteries move easily, remove them and bend battery clips to increase compression on batteries until batteries are difficult to move.

(b) Voltage checks. With the handle meter assembly removed (see section 6.2 (a) steps one and two) the rear view of the chamber assembly shows a rectangular flat black ceramic capacitor covering a brass ring. Gently bend this capacitor up to expose the bottom of a nine-pin miniature meter tube socket. Count clockwise from the one blank position. The voltages measured should be as follows:

VOLTAGES AT CHAMBER SOCKET

PINS	VOLTAGE	FUNCTION
1, 2 and 3	0.8 to 1.25 dc	Positive filament
4, 5, 6	Common negative	Negative filament
7, 8	5.34 dc	Plate
9	70-90 dc	Shell

NOTE: Use a DC voltmeter with an input impedance of 20,000 ohms per volt or greater.

CAUTION: Never short plate or shell voltages to either filament connections. A voltage of 1.35 volts or higher on the filament indicates the chamber assembly has been damaged and should be replaced.

(c) Current checks. With instrument turned "on" mr/hr range, [illegible] batteries as follows: Connect a DC current meter in series with the batteries and the battery clips using test leads. Battery current should be as follows:

BATTERY CURRENT

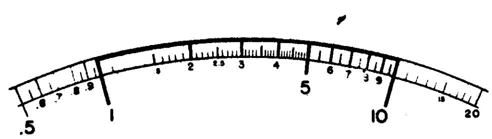
METER USED	BATTERY DRAIN TESTED	CURRENT
100 microampere	Plate	20-50 μa
100 microampere	Bucking	10-35 μa
10 milliampere	Filament	9-11 ma
100 microampere	Shell	0

7.0 APPENDIX

7.1 READING THE LOGARITHMIC SCALE

The logarithmic scale has many desirable qualities and, with a little practice, it can be read with greater accuracy than the more common linear scale.

The spacing of the marks is repeated identically through each ten-fold increase in readings. Thus the spacing of the marks from .01 to .1 is identical to that from .1 to 1 or from 1 to 10. These major divisions are called decades. The scale on this instrument has three decades.
One decade of a logarithmic scale is shown below. It is obvious that the space from 9 to 10 is far less than the space from 1 to 2. The space between numbers decreases as the numbers increase. This takes place also between whole numbers and thus the space from 1.5 to 2 is less than that from 1.0 to 1.5. Keeping this in mind it is easy to obtain accurate readings between the major divisions.



One Decade of a Logarithmic Scale

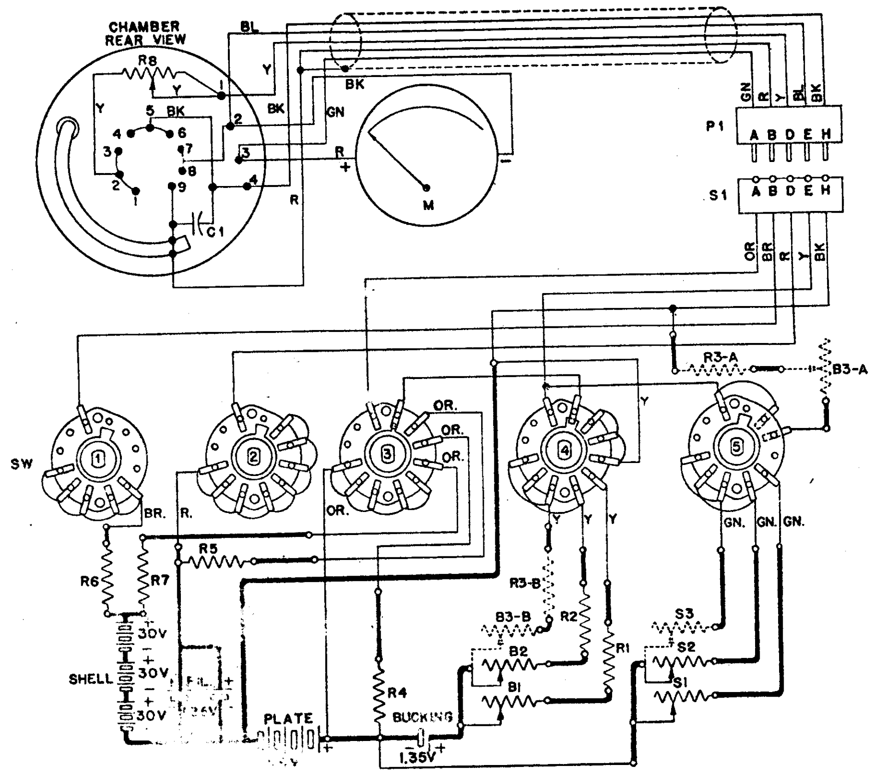
7.2 RADIOLOGICAL SAFETY

The 1 μc Sr^{90} check source used in the Model AGB-10-SR and AGB-10K-SR and the 0.1 μc source used in the Model AGB-1-SR are very small sources and perfectly safe under normal circumstances. Strontium-90 is however a dangerous poison and because of its long half-life and retention in the body, can cause serious trouble.

These sources have been carefully constructed and sealed to prevent leakage. They should however be tested for leaks periodically to insure complete safety. The A.E.C. recommends a "Wipe Test" every six months. This test is performed as follows:

a. Obtain a cotton swab. "Q-Tips" available at drug stores are suggested.
b. Dip the swab in hot water and carefully wipe the surface of the source window.
c. Dry the swab and hold it as close as possible to one of the large Beta windows on the Detector Unit. Any increase in reading indicates leakage.

If the source is found to be leaking, it should be removed, placed in a closed glass jar and returned to Jordan Electronics, Inc. for disposal and replacement, unless suitable disposal facilities for radioactive material are available. Be very careful in handling a damaged source. Touch it only with pliers and wash your hands when finished.



CHAMBER CONNECTIONS

1, 2, 3 FILAMENT POSITIVE

4, 5, 6 COMMON NEGATIVE

7, 8 PLATE

9 SHELL

FOLLOWING PARTS USED ONLY IN MODEL AGB-10K-SR
S3, R3-A, R3-B
B3-A AND B3-B

Figure 11

…ng Diagram Models AGB-1-SR AGB-10-SR AGB-10K-SR

7.3 REPLACEMENT PARTS, ELECTRICAL

Circuit Symbol	*Function*	*Description*	*Manufacturer*	*Mfgr's. No.*	*Jordan Part No.*
R1	Bucking Resistor, Range 1	Resistor, Deposited Carbon, 10-40K†			
R2	Bucking Resistor, Range 2	Resistor, Deposited Carbon, 5-15K†			
R3-A	Calibrating Resistor, Range 3	Resistor, Carbon, 47K, ½W			RC-0473
R3-B	Bucking Resistor, Range 3	Resistor, Deposited Carbon, 2.2-3.3K†			
R4	Metering Resistor, Plate bat.	Resistor, Carbon, 240K or 270K, ½W‡			RC-0244 or RC-0274
R5	Metering Resistor, Fil. bat.	Resistor, Carbon, 47K or 56K, ½W‡			RC-0473 or RC-0563
R6	Series Resistor, Shell voltage	Resistor, Carbon, 4.7 meg., ½W			RC-0475
R7	Metering Resistor, Shell bat.	Resistor Carbon, 3.9 or 4.7 meg., ½W‡			RC-0395 or RC-0475
R8	Filament Resistor	Resistor, Wire Wound 100 Ω 10W	Clarostat	R10FA	RW-6101-V
B1	Bucking Control, Range 1	Potentiometer, Wire Wound 10K, 2W	Clarostat	Series A-43	RP-2103
B2	Bucking Control, Range 2	Potentiometer, Wire Wound 10K, 2W	Clarostat	Series A-43	RP-2103
B3-A	Calibrating Control, Range 3	Potentiometer, Carbon 50K, ½W	Centralab	Model 2	RP-0503
B3-B	Bucking Control, Range 3	Potentiometer, Wire Wound 10K, 2W	Clarostat	Series A-43	RP-2103
S1	Shunt Control, Range 1	Potentiometer, Wire Wound 10K, 2W	Clarostat	Series A-43	RP-2103
S2	Shunt Control, Range 2	Potentiometer, Wire Wound 10K, 2W	Clarostat	Series A-43	RP-2103
S3	Shunt Control, Range 3	Potentiometer, Wire Wound 10K, 2W	Clarostat	Series A-43	RP-2103
C_1	Shell Filter Capacitor	Capacitor, Ceramic, .1 μf, 600V	Dilectron		CC-5105
SW	Range Switch	Wafer Switch, 5 deck	Centralab	Series 20	SR-0003
P_1	Plug, Cable	Connector, Miniature, 5 pin male	Winchester	M5P-LS	JM-0001
S_1	Socket, Control Unit	Connector, Miniature, 5 pin female	Winchester	M5S-LRN	JF-0001
M	Meter	3½″ Plastic Face Meter, 20μa or 30 μa	Triplett	PL-321	EI-0003 or EI-0004

† Selected to match chamber.
‡ Selected to match meter.

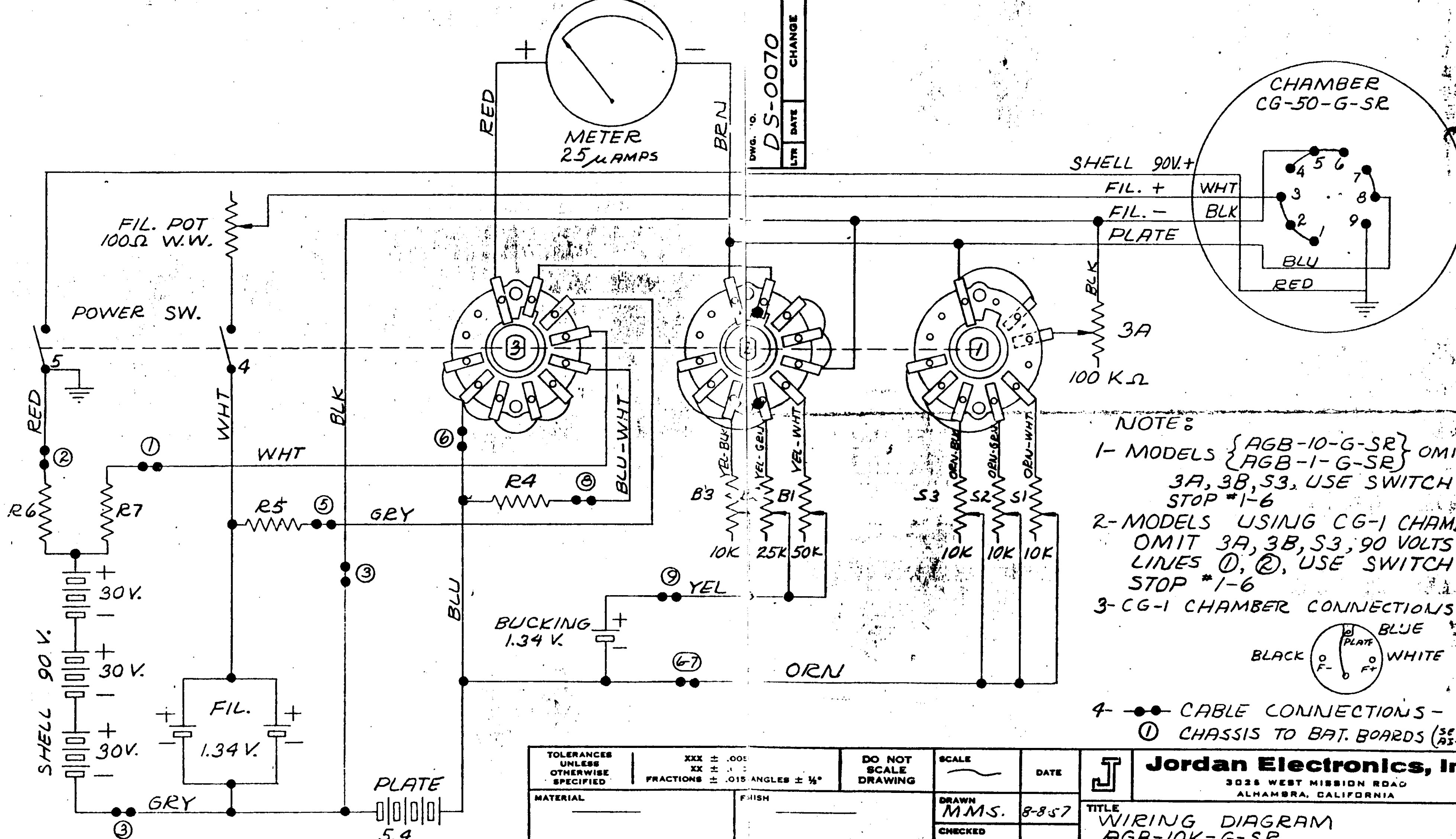
7.4 REPLACEMENT PARTS, MECHANICAL

Jordan Part No.	*Description*
AE-0001	Electronic Parts Assembly, Battery Circuit
AE-0002	Electronic Parts Assembly, Resistor Circuit
AE-0003	Electronic Assembly Control Unit
AI-0001	Printed Circuit Assembly, Resistor
AI-0002	Printed Circuit Assembly, Battery
AS-0002	Case Assembly, Upper
AS-0004	Case Assembly, Lower
AX-0001	Spool, Meter Wire
AU-0001	Control Unit, Complete
AU-0002	Detector Unit, Complete
BB-1010	Source, Sr^{90}, 1 μc
HF-0001	Hair Pin Cotter
HG-0001	Gasket, case
HG-0002	Gasket, meter
HG-0003	Gasket, Handle Assembly
HG-0004	Gasket, Pot Shafts
HG-0006	Gasket, nameplate
HG-0007	Gasket, connector
HL-0001	Stap, Neck
MM-0007	Plug, source shielding
MM-0008	Knob, Control
MM-0013	Nut, beta shutter
MS-0011	Shutter, beta 3½" gamma-beta chamber
MS-0047	Stop, source shutter
NA-0001	Nameplate

7.5 BATTERIES

Jordan Part No.	*Function*	*Manufacturer*	*Type*	*Voltage*
BA-0001	Fil. & Bucking	Mallory	RM-502R	1.34V
BA-0002	Plate	Mallory	TR-134	5.4V
BA-0003	Shell	Ray O Vac (or equiv.)	520P	30V

These batteries are widely used in hearing aids and are available at hearing aid stores and drug stores. The TR-134 is made by inserting four standard Mallory RM-1 mercury cells in series in a cardboard tube. An adequate replacement for theTR-134 can be made by pressing the old cells out of the cardboard tube and inserting four new standard RM-1 cells.
Batteries and parts listed above may be ordered directly from Jordan Electronics, Inc.



NOTE:

1- MODELS {AGB-10-G-SR, AGB-1-G-SR} OMIT 3A, 3B, S3, USE SWITCH STOP #1-6

2- MODELS USING CG-1 CHAMBER, OMIT 3A, 3B, S3, 90 VOLTS LINES ①, ②, USE SWITCH STOP #1-6

3- CG-1 CHAMBER CONNECTIONS:

BLACK F− | PLATE BLUE | WHITE F+

4- ●● CABLE CONNECTIONS – ① CHASSIS TO BAT. BOARDS (SEE AS-0008A)

DWG. NO. DS-0070	LTR	DATE	CHANGE	BY
	A			

TOLERANCES UNLESS OTHERWISE SPECIFIED	XXX ± .005 XX ± .01 FRACTIONS ± .015 ANGLES ± ½°	DO NOT SCALE DRAWING	SCALE ~	DATE	**Jordan Electronics, Inc.** 3025 WEST MISSION ROAD ALHAMBRA, CALIFORNIA
MATERIAL	FINISH		DRAWN M.M.S.	8-8-57	TITLE WIRING DIAGRAM AGB-10K-G-SR
			CHECKED		
			APPROVED		SUPERSEDES — DWG. NO. DS-0070 — A