MILITARY SPECIFICATION

RADIAC SET, AN/PDR-63( )

1. SCOPE

1.1 This specification covers one type of radiac set which is designed to measure gamma radiation and beta radiation at high and low intensities, using a self-contained radiacmeter, or the radiacmeter and either of two accessory units, in three modes of operation.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-E-1/1450 - Electron Tube, Type 8204
MIL-S-901 - Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for
MIL-M-10304 - Meters, Electrical Indicating, Panel Type, Ruggedized, General Specification for
MIL-E-16400 - Electronic Equipment, Naval Ship and Shore: General Specification
MIL-E-17555 - Electronic and Electrical Equipment and Associated Repair Parts, Preparation for Delivery of
MIL-R-22732 - Reliability Requirements for Shipboard and Ground Electronic Equipment

STANDARDS

MILITARY

MIL-STD-108 - Definitions of and Basic Requirements for Enclosures for Electric and Electronic Equipment

DRAWINGS

MILITARY

RE51F129 - H43B/U Headset Assembly

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications.- The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

OFFICIAL CLASSIFICATION COMMITTEE

Uniform Freight Classification Ratings, Rules and Regulations

(Applications for copies should be addressed to the Official Committee, 1 Park Avenue at 33rd St., New York, N. Y. 10016)

3. REQUIREMENTS

3.1 Preproduction sample.- Prior to beginning production a sample shall be tested as specified in 4.3.

3.2 General.- The equipment shall be in accordance with all provisions of MIL-E-16400 except as otherwise specified herein.

3.3 Reliability. - The following procedure outlines in detail and in simplified form the steps needed to fulfill the general requirements specified in MIL-E-16400 on reliability as it is applicable to this equipment.

3.3.1 Level. - The reliability requirement for this equipment shall be 1000 hours, mean-time-between-failures (MTBF).

3.3.2 Reliability evaluation shall be performed in accordance with the procedures for "Reliability Assurance by analysis and prediction", as specified in MIL-R-22732.

3.3.3 In addition to the regular reliability reports of MIL-R-22732, reliability prediction reports shall be submitted whenever the design changes or additional design data becomes available affecting the prediction.

3.4 Design requirements. -

3.4.1 Construction (modular). - The general requirements for modular construction in MIL-E-16400 are applicable except that the use of a module standard of dimension is not required.

3.4.2 Environmental conditions. - The equipment shall be capable of operation under the following conditions as specified in MIL-E-16400 or as modified below:

(a) Temperature, class 3.
(b) Humidity.

3.4.3 Altitude. - The equipment shall be designed to meet the altitude tests of 4.3.3.

3.4.4 Mechanical. -

3.4.4.1 Shock, vibration, inclination and noise. - Inclination and noise do not apply to this specification.

3.4.4.2 Shock. - The shock requirements shall be grade A, class 1, lightweight, type A as specified in MIL-S-901.

3.4.5 Degree of enclosure. - The high range radiacmeter, low range accessory, skin dose accessory, and battery charger shall be watertight; the carrying case shall be splashproof; in accordance with MIL-STD-108.

3.4.6 Tropicalization. - Tropicalization is not required.

3.5 Controls, indicators and panel layout. -

3.5.1 Tactile identification of controls is not required.

3.5.2 All controls shall be classified as continually required, except calibration controls.

3.5.3 Locking devices on controls are not required.

3.5.4 Elapsed time meters are not required.

3.5.5 Instruction plates are not required but required technical information shall be in the technical manual. The technical manual shall include a listing of those parts the replacement of which requires that the equipment be recalibrated.

3.5.6 Maintenance features. -

3.5.6.1 Test points. - Test points shall be identified but shall not be brought out to the case.

3.5.6.2 Blown fuse indicators. - Blown fuse indicators are not required.

3.6 Description. - The radiac set AN/PDR-63( ) shall consist of a lightweight battery-operated radiacmeter plus two plug-in accessory probes by means of which the several ranges of gamma and beta

intensities shall be measured, and ancillary components. Visual readout for all modes shall be provided by the meter in the radiacmeter. Audio readout shall be provided for the lower scale steps as indicated herein.

3.6.1 Function. - The radiac set AN/PDR-63( ) shall measure deep-dose gamma radiation over the range 0 to 1000 rads per hour in 3 scale steps; skin dose radiation (gamma or gamma plus beta) over the range from zero to 5000 rads per hour in 2 scale steps; and shall measure gamma plus beta radiation in the range 0 to 1000 millirads per hour in 4 scale steps.

3.6.2 Equipment composition. - The radiac set AN/PDR-63( ) shall include the following:

(a) High range radiacmeter
(b) Low range accessory
(c) Skin dose accessory
(d) Headset
(e) Eight batteries (four type AA, nickel-cadmium rechargeable; plus four spares)
(f) Battery charger
(g) Carrying harness for high-range radiacmeter
(h) Carrying harness for low-range accessory
(i) Carrying harness for skin-dose probe
(j) Carrying case for above complement
(k) One technical manual

3.6.3 Modes of operation. -

3.6.3.1 High-range radiacmeter. - The high-range radiacmeter shall independently measure gamma radiation in 3 scale steps:

0-1000 rad/hr
0-100 rad/hr
0-10 rad/hr

3.6.3.2 Low-range accessory. - The low-range accessory,. when plugged into the high-range radiacmeter, shall measure gamma radiation and indicate beta radiation in four scale steps:

0-1000 millirad/hr
0-100 millirad/hr
0-10 millirad/hr
0-1 millirad/hr

3.6.3.3 Skin-dose accessory. - The skin-dose accessory, when plugged into the high-range radiacmeter, shall measure skin-dose rate (gamma plus beta radiation) in two scale steps:

0-5000 rad/hr
0-500 rad/hr

3.6.4 The batteries, switch and indicating meter shall be common to all three modes of operation; and shall be contained in the high-range radiacmeter.

3.7 High range radiacmeter. -

3.7.1 Weight. - The weight shall be not more than 2-1/2 pounds.

3.7.1.1 Form and size. - The form of the housing shall be such that the radiacmeter can be carried, operated, and read while suspended from either a military cartridge belt or from a web holster belt. The dimensions shall not exceed 5-13/16 inches by 4-1/8 inches by 2-1/4 inches. There shall be no protrusions except the switch knob, on one 5-13/16 inch by 4-1/8 inch side (on the right), which may extend 3/16 inch beyond the 2-1/4 inch dimension. The meter scale shall be visible on top through one 5-13/16 inch by 2-1/4 inch side. The housing shall include a battery compartment which shall be separate from the electronics compartment, and with separate access cover for replacing batteries. There shall be an illumination switch on the top, and an access cover for calibration control.

3.7.2 Indicating meter. - The indicating meter shall be in accordance with the detail requirements of 3.17.

3.7.2.1 Meter scale drum. - The scale numbers shall appear on a cylinder of 1-1/4 inches minimum diameter, external to the meter case, and visible through the transparent window of the meter. The range switch and meter shunt resistors shall be mounted within the meter scale drum, and the rotating switch shaft shall be mechanically coupled to the drum. The scales shall be composed as shown in 3.7.2.1.1.

3.7.2.1.1 Scale sequence. - The scales shall be arranged in the following sequence and so identified:

(a) OFF
(b) BATTERY
(c) 0 - 1000 Rad/hr
(d) 0 - 100 Rad/hr
(e) 0 - 10 Rad/hr
(f) SKINDOSE
0 - 5000 Rad/hr
(g) SKINDOSE
0 - 500 Rad/hr
(h) MILLIRAD
0 - 1000 Millirad/hr
(i) MILLIRAD
0 - 100 Millirad/hr
(j) MILLIRAD
0 - 10 Millirad/hr
(k) MILLIRAD
0 - 1 Millirad/hr

3.7.2.2 Meter illumination. - The meter shall be illuminated by a lamp controlled by a push-to-operate switch located on the top of the radiacmeter housing. The illumination shall be sufficient to provide for visibility of the meter under dark-adapted conditions.

3.7.3 High-range radiacmeter-circuit. -

3.7.3.1 High-range detector. - The high-range detector shall be a recycling ion chamber, argon-filled and enclosing an electrometer tube. A guard ring shall separate the oppositely charged collectors.

3.7.3.2 Detector circuit. - There shall be a circuit to recharge the ionization chamber automatically after each discharge to a predetermined voltage. The rate of discharge and recharge (recycling) shall be proportional to the gamma field. The rate of recycling shall be approximately 500 cycles per second per 1000 rads per hour. The same ratio shall apply in all 3 scale steps.

3.7.4 Meter circuit time constant. - The effective meter circuit time constant shall be such that the length of time required for the meter to reach 90 percent of final indication after the sudden application of a constant radiation field to the equipment shall be as follows:

(a) For the high-range radiacmeter alone on the 0-10 rad/hr scale; or with the skin dose probe attached, on the 0-500 rad/hr scale: 4 to 8 seconds.
(b) For all the other scales and modes of operation of the high-range radiacmeter with or without accessories: 1.5 to 3 seconds.

3.7.5 High-range radiacmeter performance. -

3.7.5.1 Response to gamma radiation. - In determining gamma response, the energy dependence and directional dependence shall be considered as a combined effect. The accuracy shall be determined at five or more photon energies from 80 KEV to 1.3 MEV. Cesium-137 and Cobalt-60 shall be two of the test energies.

3.7.5.2 Calibration procedure. - For calibration, the direction of irradiation shall be toward and along the axis perpendicular to the front face of the housing.

3.7.5.3 Accuracy. - When irradiated by gamma radiation along the calibrating axis, the radiacmeter shall indicate intensity within plus and minus 20 percent of the true intensity, as compared with an air-equivalent ionization chamber, over the full range of energies above, for intensities greater than 10 percent of full-scale value.

3.7.5.4 Directionality and energy. - For any energy of gamma radiation within the range of 3.7.5.1, along any of the 3 principal axes (perpendiculars), the indicated intensity shall be within minus 70 percent and plus 30 percent of the true intensity.

3.7.5.5 Directionality at constant energy. - At any energy within the limit of 3.7.5.1, the average indicated intensity as measured about the 3 principal axes of rotation shall be within plus and minus 30 percent of the true intensity.

3.7.5.6 Response to low energy. - For energy of 50 keV, the response shall be not more than 50 percent of the true intensity. The ratio of response to true value shall decrease with decreasing energies below 50 keV.

3.8 Skin-dose accessory. - The skin-dose accessory shall measure the rate of beta plus gamma skin dose, as absorbed by the sensitive layer of the skin, in the scale steps 0-5000 rads per hour and 0-500 rads per hour.

3.8.1 Description. - The skin-dose accessory shall be a probe capable of use when connected to the high-range radiacmeter by means of an attached connecting cable. The probe shall include a detector and associated circuitry. Power and control shall be from the high-range radiacmeter.

3.8.1.1 Detector. - The detector shall be a sealed, recycling ion chamber, enclosing an electrometer tube, and shall have an output recycling rate compatible with that of the recycling ratemeter of the high-range instrument. The detector shall contain clean dry air at a pressure of one atmosphere and the depth of the collecting column shall be approximately one centimeter. The detector shall contain a moisture-proof "window" of approximately 40 sq. cm. area, made from mylar, aluminum leaf and polyethylene, and weighing 10-12 milligrams per sq. cm. A guard ring shall separate the ion chamber collectors. A variable capacitor connector across the ion chamber shall be provided for calibration. The calibrating capacitor shall have an air-tight, externally available adjusting screw. A guard ring shall separate the plates of the calibrating capacitor.

3.8.1.2 Dimensions. - The size shall be not more than 5-3/4 inches by 2-1/4 inches by 7/8 inch. The weight shall be not more than 10 ounces.

3.8.1.3 Protection for mylar window. - The window shall be protected by a screen with openings no larger than 3/8 inch square.

3.8.2 Response to radiation. - The direction of calibration shall be perpendicular to and toward the beta window (unmasked). The accuracy as read on the meter of the high-range radiacmeter shall be within plus and minus 10 percent of the true intensity when irradiated with Cobalt-60 for intensities greater than 10 percent of full scale value.

3.9 Low-range accessory. -

3.9.1 Description. - The low-range accessory shall measure gamma radiation in the scale steps 0-1000 millirad/hr, 0-100 millirad/hr, 0-10 millirad/hr and 0-1 millirad/hr. It shall consist of a probe and auxiliary circuit housing. The low range measurement shall be indicated on the meter of the high-range radiacmeter. The low-range accessory shall employ the switch and batteries of the high-range radiacmeter. The probe and auxiliary circuit housing shall be connected by a retractile cord, and the auxiliary housing to the high-range radiacmeter with a removable connector. The overall weight of probe and accessory shall not exceed 2-1/2 pounds.

3.9.2 Low range probe. - The low range probe shall consist of a probe housing countaining a Geiger-Muller tube and associated electronic circuitry.

3.9.2.1 Probe housing. - The probe housing shall include a movable end shield at the bottom and a movable side shield. Where exposed, the Geiger-Muller tube shall be protected by a screen. The bottom end of the tube shall be set back not more than 0.178 inch from the end of the probe housing. The overall outside diameter of the housing shall be not more than 1.350 inches for a length of 0.375 inch from the same end. The overall weight including GM-tube and electronics circuitry shall be not more than 13 ounces. For calibration of the probe, the calibration control shall be located at the end opposite from the tube window, and shall be accessible through an access cover.

3.9.2.2 Geiger-Muller tube. - The detector in the probe shall be a single Geiger-Muller tube type 8204 in accordance with MIL-E-1/1450 (all metal, approximately 30 milligrams per cm^2).

3.9.3 Low-range auxiliary. -

3.9.3.1 Circuit. - The low range auxiliary circuit, contained in the low range auxiliary housing, shall include Hi voltage DC power supplies and pulse generator, as required, and an output circuit to provide for compatible indication on the meter of the high range radiacmeter. There shall be an output for the head phone.

3.9.3.2 Auxiliary housing. - The low-range auxiliary housing shall be not more than 5-13/16 inches long by 2-1/4 inches wide. A jack shall be provided at the rear for head phone connection. The retractile cord to the probe and the headphone jack shall enter at the front end; the connecting cord to the high range module shall enter at the opposite end.

3.9.3.3 Low-range accessory response to radiation. - In determining accuracy, the requirements of 3.7.5.1 shall apply. For calibration, the probe shall be irradiated in a direction perpendicular to its long axes. The low range accessory shall be tested for directional response about the long axis of the cylindrical probe with the probe alone in the radiation beam. Both the end window and side window beta shutters shall be closed. For any combination of energy and direction as specified above, the indicated intensity shall be within plus and minus 20 percent of the true intensity for the 0-100 millirad/hr and 0-1000 millirad/hr ranges, and within plus and minus 40 percent of the true intensity for the 0-1 millirad/hr and 0-10 millirad/hr ranges. For a source energy of 35 keV, the ratio of indicated intensity to true intensity shall be less than 0.5; and for source energies less than 20 keV, the ratio shall be zero.

3.10 Battery Drain. - At any voltage up to 2.6 volts, the equipment shall draw no more current than the values stated below:

(a) High-range radiacmeter only, at 1000 rads/hr: 15 milliamps;
(b) Skin-dose probe and high-range radiacmeter combined, at 5000 rads/hr: 15 milliamps;
(c) Low-range accessory and high-range radiacmeter combined, at 1000 millirads/hr: 55 milliamps;
(d) The illuminating lamp shall draw not more than 65 milliamps.

3.11 Saturation. - In any mode of operation, if the equipment is operated in a field of greater intensity than the scale value, up to 10,000 rad/hr, the meter shall indicate higher than full scale.

3.12 Headset. - The headset shall be in accordance with Drawing RE51F129, type H43B/U or equivalent which can fit under a standard battle helmet. There shall be a 3 foot connecting cord.

3.13 Battery charger. - The battery charger shall consist of a circuit to recharge 4 nickel-cadmium cells, type AA, at one time. The charger shall operate from input current at 115V AC, 12V DC and 24V DC, as selected. The charger shall be capable of fully recharging a completely discharged set of 4 cells within 24 hours. The charger shall be mounted in a housing which shall also hold the 4 batteries being charged. There shall be accord with a plug for the 115V AC connection and cords with insulated clips for 12V and 24V DC connection. The battery charger shall not exceed 5 inches by 1-1/4 inches by 1-1/2 inches (exclusive of cords) in size, The charger shall include a means of preventing back discharge to a DC power source. The charger shall weigh, including batteries, not more than one pound.

3.14 Carrying harness. - Vinyl impregnated close-fitting nylon carrying pouches shall be provided for the high-range instrument, the skin-dose accessory, and the high-range instrument - low-range accessory combination. The high-range instrument and skin-dose carrying pouches shall be designed to be suspended from a military cartridge belt or from a web holsted belt. A shoulder strap shall be provided. The pouches shall be designed so that the meter can be easily read and the operating controls are readily accessible.

3.15 Carrying case. - The carrying case shall be designed to carry all the complement specified in 3.6.2 (a) through (1). Space shall be provided for storing all eight battery cells outside the radiacmeter. The several items of the complement shall be stored in the carrying case in such a way that each may be removed and replaced without disturbing any others. The material of the carrying case shall be aluminum. The size and weight shall be the minimum consistent with other requirements.

3.16 Surface finish. - The high-range radiacmeter, the skin dose probe, the auxiliary circuit housing of the low-range accessory, and the carrying case shall be painted gray in accordance with MIL-E-16400.

The low-range probe housing shall not be painted but shall be dull finished and treated to prevent corrosion. All surfaces shall be as smooth as possible with the minimum number of crevices to collect dust. Rubber or felt feet shall not be used. Surfaces shall be easily decontaminable without recourse to laboratory methods.

3.17 Indicating meter. - The indicating meter shall be a ruggedized, direct-current type encased in a specially shaped plastic housing. The meter shall be designed to be used with an external, rotating-drum, range-changing mechanism which is not part of the meter. Except as otherwise specified herein, the meter shall be in accordance with the provisions of MIL-M-10304.

3.17.1 Design and construction. - Unless otherwise authorized by the procuring activity, the meters shall be of the design, construction and physical dimensions specified in figure 1.

3.17.1.1 Housing. -

3.17.1.1.1 Material. - The housing shall be made from a material of a type which will enable the meter to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.17.1.1.2 Construction. - The housing may consist of two pieces: a case and a cover. The cover shall be bonded to the case with a suitable sealing compound which will enable the meter to meet the watertight requirement specified in 3.17.15 herein.

3.17.1.1.3 Window. - That portion of the cover directly above the scale plate shall serve as the meter window and as such shall conform to the window requirements of MIL-M-10304. In addition, the area of the case immediately below the slot in the scale plate (see 3.17.1.2 herein) shall be transparent and shall meet the same requirements as the window so as not to cause blurring of the scale figures on the external drum.

3.17.1.1.4 Scale illumination. - The area of the case immediately forward of the scale plate shall be transparent to permit illumination of the dial with an external lamp. The lamp and lamp accessories are not part of this specification.

3.17.1.1.5 Finish. - The surfaces of the housing shall be treated as required to minimize the electrostatic attraction of the pointer due to static properties of the materials. Unless otherwise authorized by the procuring activity, other external finishes such as paint shall not be used.

3.17.1.2 Scale plate. - The scale plate shall be marked as specified in figure 2. An opening shall be provided directly forward of the scale through which scale figures on an external rotating drum will be visible corresponding to the range in use.

3.17.1.3 Scale angle. - The scale angle shall be 60 degrees minimum.

3.17.1.4 Scale length. - The scale length shall be not less than 1.20 inches.

3.17.1.5 Color scheme. - The meter shall be in color scheme W.

3.17.1.6 Full-scale range. - The full-scale range of the meter shall be 20 microamperes.

3.17.1.7 Zero position. - The zero position of the pointer shall be at the left side of the meter (zero left).

3.17.1.8 Zero adjustment. - A zero-corrector shall be provided in the cover with the head of the zero-corrector flush or preferably below the top surface. The area over the zero-corrector shall be covered with a suitable waterproof, pressure sensitive tape such as plastic electrical insulation type (see 3.17.15 and 4.8.1.1 herein).

3.17.1.9 Terminal polarity. - The polarity of the input terminals shall be as indicated on figure 1.

3.17.2 Mounting hardware. - No mounting hardware shall be included.

3.17.3 Normal operating position. - The normal operating position shall be horizontal with the moving element axis vertical.

3.17.4 Position influence. - The position influence shall not exceed plus or minus 3 percent of the full scale length, maximum change for a 60° rotation around each of three mutually perpendicular axes from the normal horizontal operating position.

3.17.5 Initial accuracy. - The initial accuracy error shall not exceed plus or minus 3 percent of full scale value when tested as specified in MIL-M-10304.

3.17.6 Damping factor. - The damping factor shall be 5.0 or greater.

3.17.7 Response time. - The response time shall not exceed 4.0 seconds.

3.17.8 Power consumption (loss). - The electrical resistance of the meter as measured at the input terminals shall be 2,200 ± 440 ohms.

3.17.9 Heat effect at 65°C. - The change in indication at 65°C. shall not exceed 5 percent of full-scale value. The permanent change in indication shall not exceed 3 percent of full-scale value.

3.17.10 Temperature influence. - The temperature influence shall not exceed plus or minus 1 percent of full-scale value.

3.17.11 Exposure to extreme temperatures. - The change in indication at minus 55°C. shall not exceed 5 percent of full scale value. The permanent change in indication after exposure shall not exceed 3 percent of full-scale value.

3.17.12 Short time overload. - The change in indication shall not exceed 1 percent of full-scale value.

3.17.13 Sustained overload. - The meter shall meet the following requirements after subjection to the sustained overload test:

	Percent full-scale value
Temporary zero shift, maximum	1
Permanent zero shift, maximum	1
Permanent change in indication, maximum	2

3.17.14 Dielectric withstanding voltage. - The meter shall withstand 1,000 volts root mean square without damage or flash over.

3.17.15 Watertightness. - Except for the zero corrector, the meter shall be watertight and shall be tested as specified in 4.8.1.1.

3.17.16 Moisture resistance. - The permanent change in indication after the moisture resistance test shall not exceed 5 percent of full scale value and the friction error shall not exceed 6.5 percent of full scale length.

3.17.17 Friction error. - The friction error requirement of MIL-M-10304 shall not apply.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Contractor's quality assurance system. - The contractor shall provide and maintain a quality assurance system acceptable to the Government for the supplies covered by the contract. The quality assurance system shall serve to supplement and implement the design, performance and test requirements of this specification.

4.2 General inspection. - The general inspection of the equipment shall consist of the following:

(a) Preproduction inspection.
(b) Production inspection.
(c) Production control inspection.
(d) Environmental inspection.

4.2.1 Reliability testing. - Reliability testing shall be performed in accordance with test level 4 of MIL-R-22732.

4.2.1.1 Accelerated life tests specified in MIL-E-16400 will not be required for preproduction equipments. In lieu of this test, reliability tests as specified herein shall be required.

4.2.1.2 Demonstration of a reliability level of 300 hours (MTBF) will be considered as demonstration of compliance with the reliability requirements specified herein. The minimum test time on each equipment shall be 450 hours. Accept-reject criteria shall be in accordance with the accept-reject criteria specified in MIL-R-22732. If an accept decision cannot be made in 700 hours, the test shall be terminated and the required reports of the tests as specified in MIL-R-22732 shall be submitted to the Command or agency concerned. The decision to accept or reject will be made by the Command or agency concerned based on the test reports.

4.2.1.3 Sampling for the reliability tests shall be in accordance with 4.5.1, incidental to production control inspection.

4.2.1.4 The performance parameters to be monitored shall be as specified in 4.3.1.

4.3 Preproduction inspection. - Preproduction inspection shall be as specified in MIL-E-16400, except as follows:

(a) Supply line voltage and frequency.
(b) Water cooling.
(c) Heat.
(d) Power.
(e) Accelerated life.

4.3.1 In addition to the preproduction inspection specified in 4.3, the following tests shall be performed to determine conformance with this specification:

(a) Operating, average conditions (3.7.5, 3.8.2 and 3.9.3.3)
(b) Battery drain (4.3.1.1)
(c) Accuracy (3.7.5.3)
(d) Altitude (3.4.3)

4.3.1.1 Tests of battery drain. - The test of 4.3.1(b) shall be made to determine compliance with the battery drain limits of 3.10. Such tests shall be valid only if the equipment tested meets the accuracy requirements of 3.7.5.3, 3.8.2 and 3.9.3.3.

(a) High-range radiacmeter - Battery drain shall be measured during operation on each scale position at full scale value. For this purpose, an electronic pulse generator may be substituted for the detector supplying pulses at rates in accordance with 3.7.3.2. However, the detector shall not be disconnected.
(b) Skin dose probe and high-range radiacmeter combined. - The same procedure as in 4.3.1.1(a) applies, except that the pulse-rates of 3.8.1.1 apply.
(c) Low-range probe and high-range radiacmeter combined - Battery drain shall be measured at full scale value on each scale. For this purpose, appropriate beta radiation may be substituted for gamma radiation.

4.3.2 Equipment shall not be submitted for preproduction approval until after it has satisfactorily passed tests for shock, (see 3.4.4), and vibration, and supporting data submitted to the Inspector.

4.3.3 Altitude test. - The equipment shall be operated for a period of 24 hours while exposed to an air pressure of 8.8 inches of mercury at a temperature of -40°C., and shall then be turned off and exposed to an air pressure of 3.4 inches of mercury at a temperature of -54°C. for an additional 24-hour period. The equipment shall meet the performance requirements of this specification throughout the first 24-hour period and subsequent to the test.

4.4 Production inspection. - The operating tests of production inspection shall include:

(a) Tests of the equipment in all 3 modes of operation: high-range, skin-dose and low-range.
(b) Tests of accuracy on all scales, for conformity with 3.7.5, 3.8.2 and 3.9.3.3.

4.4.1 Break-in period. - Prior to production inspection, each equipment shall be operated exposed to gamma radiation as follows:

(a) High-range radiacmeter only, on the 0-10 rad/hr range, intensity 6 to 10 rad/hr, for 90 hours. The indication shall not vary more than 1 rad/hour throughout the entire period.
(b) Low-range configuration, with low-range accessory plugged into the high-range radiacmeter for 60 hours.
    (1) On the 0-1 millirad/hr range, intensity 0.6 to 1.0 millirad/hr; variation not more than 0.2 millirad/hr range.
    (2) On the 0-100 millirad/hr range, intensity 60 to 100 millirad/hr; variation not more than 10 millirad/hr.

4.4.1.1 For the break-in runs, an external power source may be used and beta radiation may be substituted in the low-range.

4.5 Production control inspection. - Production control inspection shall consist of the following tests:

(a) Enclosure test.
(b) Battery drain test in all 3 modes of operation (4.3.1.1).
(c) Controls.
(d) Reliability.

4.5.1 Sampling plan. - The units used for the production control test shall be selected from the units passing the production inspection on the basis of the sampling plan herein.

4.5.1.1 Sampling for production control inspection. - Samples for production control inspection shall be selected at random from those equipments which have passed the production inspection (see 4.4). The sample size shall be determined in accordance with table I.

Table I - Sampling for production control inspection.

Number of radiac sets in inspection lot	Number of radiac sets in sample	Number of equipments nonconforming on any tests	
		Acceptance number	Rejection number
15 and under	3	0	1
16 to 40	5	0	1
41 to 110	7	0	1
111 to 300	10	0	1
301 and over	15	1	2

4.5.1.2 Each of the sample radiac sets selected in accordance with 4.5.1.1 shall be subjected to each of the tests specified in 4.5 to determine compliance with this specification. Failure to conform shall be counted as a defect and the radiac set shall be rejected. If the number of such nonconforming radiac sets in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected.

4.6 Environmental tests. - Environmental tests shall include tests for temperature and humidity only.

4.6.1 Sampling plan. - The units used for environmental tests shall be drawn from the units passing production control inspection on the basis of 1 unit per 15 production control samples, except that not more than one unit shall be drawn per 300 production equipments.

4.7 Preproduction (pilot pack sampling). - Prior to packing the equipment in quantity, a pilot pack shall be inspected to determine conformance with the sampling, inspection, and test procedures of the contract or order, except that the pilot pack will not be required when the prime or subcontractor has previously had such a pack tested and accepted for identical equipment on a Military contract, and can furnish satisfactory evidence that the equipment is being packed identically with the approved pack. Approval of the pilot pack shall not relieve the contractor of his obligation to preserve, package, and pack the equipment (and accessories when specified) in conformance with the requirements of the contract or order.

4.8 Inspection of indicating meter. - Except as otherwise specified herein, the indicating meter shall be inspected in accordance with MIL-M-10304.

4.8.1 Performance testing. -

4.8.1.1 Watertightness. - The meter shall be allowed to reach thermal equilibrium in an ambient atmosphere not exceeding 20°C. The area over the zero corrector shall be temporarily sealed with a suitable waterproof, pressure-sensitive tape (such as plastic electrical insulation tape). The meter shall then be submerged to a depth not exceeding 6 inches in tap water at a water temperature not less than 60°C. The meter shall be held submerged for 5 minutes, during which time the meter shall be observed for evidence of leakage as indicated by bubbles emanating from the interior of the meter. Any such bubbles shall be considered as failure to pass the test. Bubbles which are the result of entrapped air on the various exterior parts of the case and bubbles emanating from the zero corrector shall not be considered as leaks.

4.8.1.2 Impact test for windows. - The impact test for windows of MIL-M-10304 shall not apply.

4.8.1.3 Thermal shock by immersion. - The thermal shock by immersion tests of MIL-M-10304 shall not apply.

4.8.1.4 Vibration. - The meter shall be tested in accordance with MIL-M-10304 except for the following conditions:

(a) Method of mounting. - The meter shall be housed in a mounting fixture as shown on figure 3. The fixture shall then be securely fastened to a suitable mounting plate and the whole assembly mounted on the test apparatus so that the meter is in the normal horizontal operating position.
(b) After this test, friction error is not applicable.

4.8.1.5 Random drop. - The meter shall be tested in accordance with MIL-M-10304 except for the following conditions:

(a) Method of mounting. - The meter shall be housed in a mounting fixture as shown on figure 3. The fixture shall then be securely mounted in the standard steel sleeve used in the random drop test.
(b) After this test, friction error is not applicable.

4.8.1.6 Shock. - The meter shall be tested in accordance with MIL-M-10304 except for the following conditions:

(a) Method of Mounting. - The meter shall be placed in a mounting fixture as shown on figure 3. The fixture shall then be securely mounted on the standard mounting panel used for shock tests so that the meter is in the normal horizontal operating position.
(b) After this test, friction error is not applicable.

4.8.1.7 Evaluation. - The contractor shall plan and conduct a detailed evaluation of the meter to determine conformance to all of the requirements specified. A detailed record shall be kept of all of the tests and shall be included in an evaluation report. The contractor shall build a sufficient number of meters

so that a representative sample of units is available for all of the tests. Meters delivered as part of the AN/PDR-63() shall be subjected only to the tests specified in 4.8.1.8

4.8.1.8 Testing of production meters. - The contractor shall perform the following tests on all meters specified for delivery as part of the AN/PDR-63() equipment and shall include the results thereof in the evaluation report:

(a) Visual and mechanical examination, external
(b) Position influence
(c) Zero adjustment
(d) Sticking below zero
(e) Initial accuracy
(f) Damping factor
(g) Response time
(h) Power consumption (loss)

5. PREPARATION FOR DELIVERY

5.1 Domestic shipment and early equipment installation and for storage of onboard repair parts. -

5.1.1 Basic equipment or item. -

5.1.1.1 Preservation and packaging. - Preservation and packaging which may be the supplier's commercial practice, shall be sufficient to afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity and until early installation.

5.1.1.2 Packing. - Packing shall be accomplished in a manner which will insure acceptance by common carrier at the lowest rate and will afford protection against physical or mechanical damage during direct shipment from the supply source to the using activity for early installation. The shipping containers or method of packing shall conform to the Uniform Freight Classification Ratings, Rules and Regulations or other carrier regulations as applicable to the mode of transportation and may conform to the suppliers commercial practice.

5.1.1.3 Marking. - Shipment marking information shall be provided on interior packages and exterior shipping containers in accordance with the contractor's commercial practice. The information shall include nomenclature, Federal stock number or manufacturer's part number, contract or order number, contractor's name and destination.

5.1.2 Onboard repair parts. - Onboard repair parts shall be preserved, packaged, packed and marked as specified in MIL-E-17555.

5.2 Domestic shipment and storage or overseas shipment. - The requirements and levels of preservation, packaging, packing and marking for shipment shall be specified by the procuring activity (see 6.1).

(5.2.1 The following provides various levels of protection during domestic shipment and storage or overseas shipment, which may be required when procurement is made.

5.2.1.1 Preservation, packaging, packing and marking. - The equipment shall be preserved, packaged, packed and marked for the levels of shipment as specified (see 6.1) in accordance with MIL-E-17555.)

6. NOTES

6.1 Ordering data. - Procurement documents should specify the following:

(a) Title, number and date of this specification.
(b) Preservation, packaging, packing and marking requirements other than those required by 5.1 (see 5.2).

Preparing activity:
Navy - Ships
(Project 6665-N229Sh)

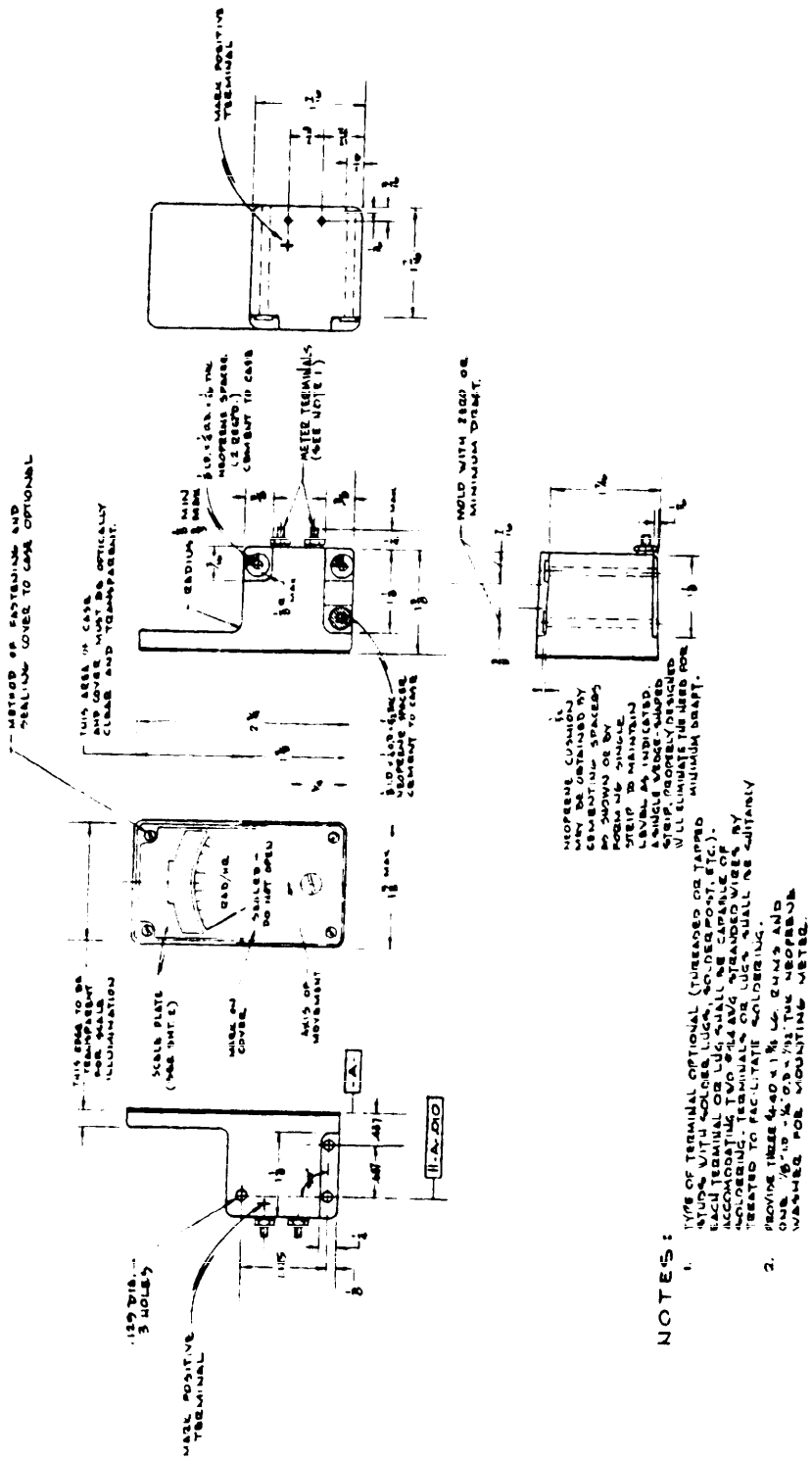

Figure 1 - Housing details.

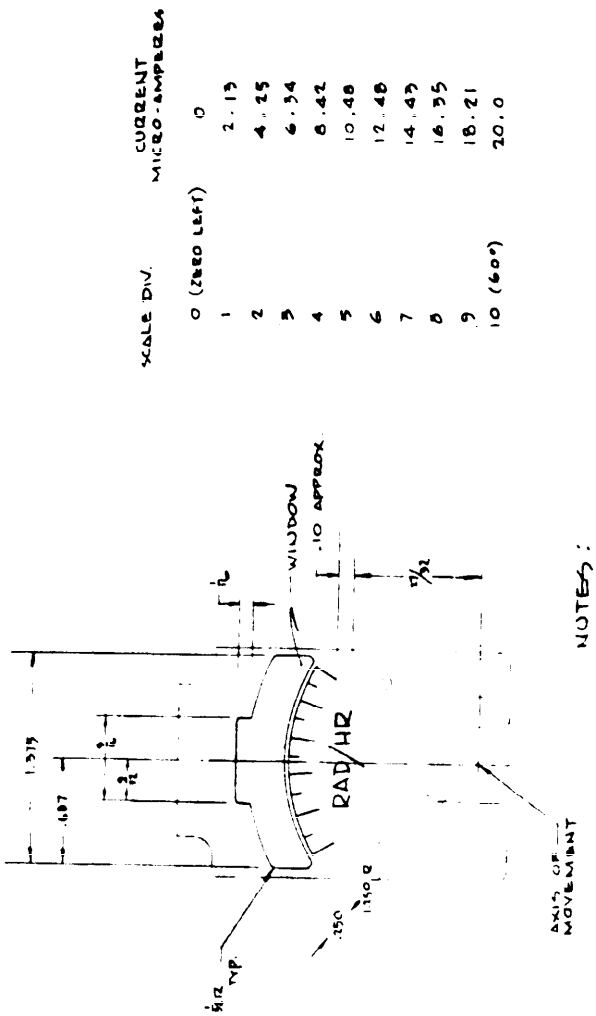

Figure 4 - Scale plate.

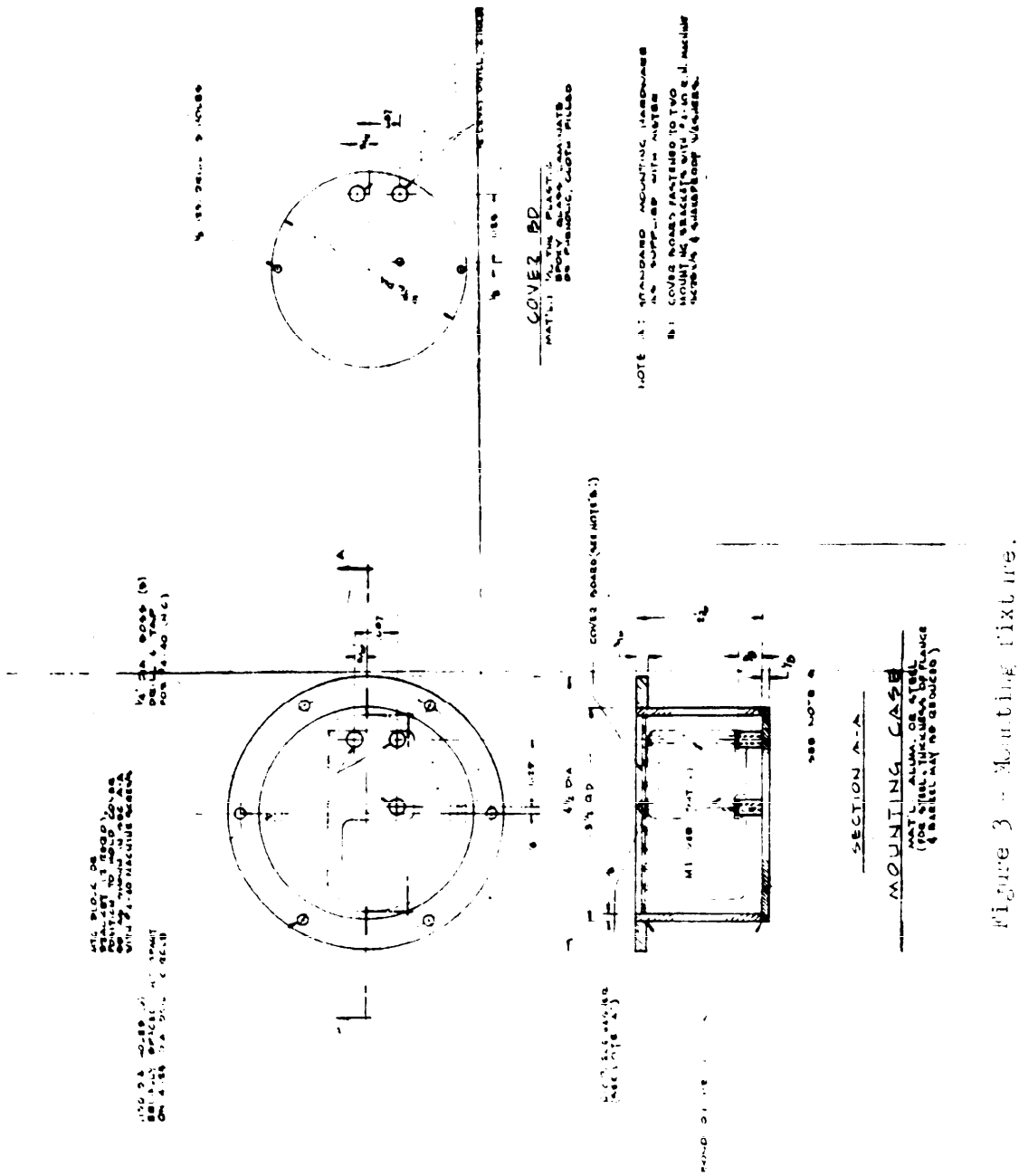

Figure 3 - Mounting fixture.

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

ORGANIZATION *(Of submitter)* | CITY AND STATE

CONTRACT NO. | QUANTITY OF ITEMS PROCURED | DOLLAR AMOUNT $

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)* | DATE

DD FORM 1 APR 63 1426 REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE

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