MILITARY SPECIFICATION

RECORDER-REPRODUCER SET, SOUND, AN/UNQ-8( )

1. SCOPE

1.1 This specification covers a seven-channel, four-speed magnetic tape recorder-reproducer set intended primarily for use in the recording and evaluation of various signals.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, form a part of this specification to the extent specified herein:

SPECIFICATIONS

MILITARY

MIL-T-27 - Transformers and Inductors (Audio, Power and Pulse).
MIL-C-62 - Capacitors, Fixed, Electrolytic (D.C. Aluminum, Dry, Electrolytic, Polarized).
MIL-I-983 - Interior Communication Equipment, Naval Shipboard, Basic Design Requirements for.
MIL-E-17555 - Electronic and Electrical Equipment and Associated Repair Parts, Preparation for Delivery of.
MIL-I-17623 - Interference, Radio, Requirements, Methods and Limits (14KC to 1000MC) for Electric Office Machines, Printing, and Lithographic Equipment.
MIL-T-22756 - Tape, Recording, Sound and Instrumentation, Magnetic Oxide Coating, General Specification for.
MIL-R-22842 - Reels and Hubs for Magnetic Recording Tape, General Specification for.

STANDARDS

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-275 - Printed Wiring for Electronic Equipment.
MIL-STD-701 - Preferred and Guidance List of Semiconductor Devices.

(Copies of specifications, standards, drawings, and publications required by contractors 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 document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

OFFICIAL CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules

(Application for copies should be addressed to Official Classification Committee, 1 Park Avenue at 33rd Street, New York 16, New York).

INTER-RANGE INSTRUMENTATION GROUP (IRIG)
Document No. 106-60 - Telemetry Standards

(Application for copies should be addressed to Secretariat, Inter-Range Instrumentation Group, White Sands Missile Range, New Mexico.)

3. REQUIREMENTS

3.1 Preproduction sample.- Prior to beginning production, a sample of the magnetic tape recorder-reproducer equipment shall be tested as specified in 4.2 (see 6.3).

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3.2 Description.- The recorder-reproducer set shall be capable of recording signals on seven channels, and simultaneously reproducing the recorded signals from the tape. The recorder-reproducer set shall consist of two units, a recorder-reproducer unit and a remote control unit.

3.2.1 Recorder-reproducer unit.- The recorder-reproducer unit shall consist of the following sections:

3.2.1.1 Tape transport section.- The tape transport assembly shall contain all the mechanical components such as the tape guides, capstans, capstan idlers, motors, and all electronic components required for transporting the tape.

3.2.1.2 Electronic assembly.- The electronic section shall consist of individual removable modular amplifier sections necessary for preamplification, amplification, and equalization in recording and playback.

3.2.1.3 Enclosure.- The tape transport and the electronic section for the recorder-reproducer set shall be mounted in a single shock-and vibration-mounted enclosure. Terminal boards for connection of ship's wiring and any plugs or jacks necessary for connection of amplifier and transport sections shall be mounted in the enclosure.

3.2.1.3.1 The recorder-reproducer set shall be of the door-type construction wherein the tape transport mechanism, controls, indicator meters, and individual channel amplifiers are mounted on a front panel which is designed to open out for accessibility in servicing. Another door with a panel of a clear transparent material shall be provided as a dust cover for the tape drive system. The transparent panel shall be sufficiently large to enable viewing the head assembly, tape drive mechanism, and enough of both take-up and supply reels to permit determining what portion of the tape length is being recorded or played back.

3.2.2 Remote control.- A remote control unit containing the necessary components to place the recorder-reproducer in the record mode shall be provided with each equipment. This box shall be of a fabricated type designed for mounting on a sonar equipment.

3.3 General features.- The equipment shall be in accordance with the following paragraphs of MIL-I-983 in addition to the requirements specified herein. (Whenever a requirement of MIL-I-983 conflicts with a requirement of this specification, the requirement of this specification shall govern).

General requirements
Definitions
Materials, general
Substitution of (equal or superior) materials or parts
Fungus-inert materials
Unacceptable materials
Acceptable materials
Flammable materials
Arc-resistant materials
Toxic materials
Wood
Metals
Aluminum
Magnesium
Iron or steel
Nonferrous material (except aluminum)
Zinc
Springs (material)
Other metals
Plastics
Ceramics
Impregnating, embedding and encapsulating compounds
Glass
Lubricants and lubrication
Painting (see 3.11)
Protection against corrosion
Bolts, machine screws, studs and nuts
Parts - mechanical
Gaskets
Dials and pointers

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Dial sizes
Locking devices
Washers
Ball bearings
Parts, electrical - general
Use of nonstandard parts
Requirements for semiconductor devices
Electron tube or capacitor sockets
Capacitors
Variable resistors
Transformers
Relays
Electrical tapes
Dial illumination lamps
Switches
Indicator lights and lampholders
Fuses
Fuseholders and fuseclips
Metallic rectifiers
Printed wiring and circuits
Enclosures - general
Enclosure - accessibility
Enclosure - degree of
Enclosure - mounting
Stiffening grooves
Minimum sheet metal thicknesses
Through belting
Cable entrance
Cable entrance plates
Ventilation
Size (for submarines and surface ships)
Threaded devices
Rounded corners and edges
Internal subassembly protection
Drilled and tapped holes
Welding
Temperature and humidity
Features - electrical
Primary power supply circuits
Power supply tolerances
Personnel protection
Shielding and radio frequency noise reduction
Ground potential and grounding
Soldering
Electrical parts mounting
Internal subassembly connection (test cable required)
Terminal boards, connectors and terminals
Wiring
Color coding
Dial illumination
Electrical insulation
Airborne noise
Structureborne noise (grade C)
Drawings - general
Drawings - preliminary
Drawings - working
Schematic diagrams
Wiring diagram
Drawing list
Assembly drawings
Drawings - manufacturing
Bill of materials

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Interchangeability and standardization
Manuals (type I)
Repair parts (electronic)
Designation and marking (Serial numbers are required) (see 3.10)
Reports
Item names and nomenclature
Workmanship and general examination

3.4 System requirements.-

3.4.1 Time of operation.- The equipment shall be designed for continuous operation, and shall be capable of passing the operating test of 4.5.1 and the accelerated life test specified in 4.5.14.

3.4.2 Recording and reproducing medium.- The recording and reproducing media shall be 1/2-inch wide magnetically coated polyester film base tape wound on a 10.5-inch reel. The tape and reels shall be in accordance with MIL-T-22756 and MIL-R-22842, respectively (see 6.2).

3.4.3 Tracks.- Seven channels shall be recorded on 1/2-inch wide tape. Track spacing shall be in accordance with IRIG Document No. 106-60.

3.4.4 Tape speeds.- The tape shall move at linear speeds of 3.75 ± 0.05, 7.5±0.1, 15 ± 0.2, and 30 ± 0.4 inches per second (i.p.s.) while recording and reproducing. All changes in equalization required by these speeds shall be accomplished by actuation of the speed selector push buttons.

3.4.5 Fast-forward.- Facilities for fast-forward operation shall be provided by means of push buttons. Fast operation shall be at an average speed of at least 300 inches per second.

3.4.6 Rewind.- Facilities for rewind operation shall be provided by means of push buttons. Rewind operation shall be at an average speed of at least 300 inches per second.

3.4.7 Record.- A push button shall be provided which when operated will place the recorder-reproducer set in the record mode. All seven channels shall be recorded simultaneously. Provision shall be made to prevent inadvertent operation of the record switch.

3.4.8 Playback.- A push button shall be provided which when operated will place the recorder-reproducer set in the playback mode. All seven channels shall be played back simultaneously. If the operation selection sequence is from record to playback, the equipment shall record and playback simultaneously.

3.4.9 Stop.- A push button shall be provided which when operated will stop the recorder-reproducer set from any previous mode of operation.

3.4.10 Record level control.- A rotary-type control for each channel shall be provided on the front panel of each individual amplifier assembly to allow signal level adjustment in the record mode.

3.4.11 Playback level control.- A rotary-type control for each channel shall be provided on the front panel of each individual amplifier assembly to allow output signal level control of any channel in the playback mode.

3.4.12 Record level indicators.- A decibel (db) meter for each channel shall be mounted on the front panel of each individual amplifier assembly. It shall be calibrated to show optimum recording level at zero db on the meters. A two-position switch shall be provided on the front panel of each individual amplifier assembly. This switch shall have two marked positions: input and output. When the switch is placed in the "input" position, the meter shall be connected to indicate the level of the incoming signal, regardless of the transport operating mode, whenever power is supplied to the equipment. When the switch is in the "output" position, the meter shall be connected to indicate the level of the recorder output signal, regardless of the transport operating mode, whenever power is supplied to the equipment. With the switch in the "output" position, zero db on the meter shall indicate a recorder output of zero dbm.

3.4.13 Erasure.- Erasure of the tape shall occur automatically during the recording process in such a manner that the full width of the tape shall be erased prior to reaching the recording head.

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3.4.14 Control interlock.- Mode selection controls shall be interlocked so that switching from operation to operation will not break or permanently distort the tape.

3.4.15 Inputs.- The recording amplifiers for the recorder-reproducer shall have the inputs available on terminal boards as shown in table I. All inputs shall be balanced to ground.

Table I - Inputs.

Type of input	Impedance (ohms)	Maximum level	Minimum level
		(volts)	(volts)
Direct record (mike)	150	0.02	0.0004
Direct record (bridging)	30,000	0.5	0.01
FM record (bridging)	30,000	15	0.5
FM record (line)	600	7.75	0.077

3.4.16 Input voltage range.- The recorder-reproducer shall meet the distortion requirements at rated power output over the input voltage ranges shown in table I.

3.4.17 Outputs.- The playback amplifiers for all channels shall have a balanced output of 1 volt across a 600-ohm load with a capacitance not to exceed 0.01 microfarad. These outputs shall be available on the equipment terminal boards.

3.4.18 Power switch.- A power switch which will disconnect both sides of the power supply line when in the OFF position shall be provided. A pilot light shall be provided to indicate when the power switch is in the ON position.

3.4.19 Remote operation.- The following facilities shall be provided at the remote control box:

3.4.19.1 Standby indication.- Indication that the recorder-reproducer is in standby condition shall be provided by a light.

3.4.19.2 Standby record switch.- The operator shall be capable of placing the recorder-reproducer set into the record mode from standby.

3.4.19.3 Recording indication.- Indication that the recorder-reproducer is recording shall be provided by a light.

3.4.19.4 End of reel indication.- Indication of the end of the tape reel shall be visually provided by flashing the "record light" at approximately 1 flash/second. This indication shall be provided approximately 5 minutes before the end of the tape when operating at 15 inches per second.

3.4.20 Tape counter.- A four-digit mechanical counter shall be provided on the transport to give a measure of the tape used.

3.4.21 End-of-reel indication.- An indicator shall be provided at the recorder to show the end of the recording tape. This indication shall occur approximately 5 minutes before the end of the tape, when operating at 7.5 inches per second.

3.4.22 Shock, vibration, and inclination.- The recorder-reproducer set shall meet the shock, vibration, and inclination requirements for nonvital equipment specified in MIL-I-983.

3.5 Mechanical requirements.-

3.5.1 Size.- The AN/UNQ-8( ) recorder-reproducer set shall not exceed the dimensions shown in table II.

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shall be provided with a buffer amplifier and shall present not less than 50 dB attenua-

Table II - Dimensions.

	Recorder-reproducer	Remote Control Unit
	(inches)	(inches)
Height	30	3
Width	22	5
Depth	14	4

All dimensions shall be measured in the normal operating condition of the equipment, and shall include all projections, shock/mounts and controls on the body of the equipment. The recorder-reproducer set shall be capable of passage through a circular hatch 25 inches in diameter with shock mounts (if used) removed.

3.5.2 Weight.- The weight of the recorder-reproducer shall not exceed 160 pounds. The weight of the remote control box shall not exceed 2 pounds.

3.5.3 Mounting.- The recorder-reproducer set shall be designed for deck mounting. Shock isolators may be used, if required, between the equipment and deck and the back of the equipment and the bulkhead. If shockmounts are used, a grounding strap shall be provided to insure a good conducting path between the case and the mounting base.

3.5.4 Power supply.- The equipment shall be designed to operate with a power supply of 115 volts, 60 cycles, single phase. Performance of the equipment shall not be affected by the power supply variations required by MIL-I-983.

3.5.5 Cable connections.- Cable entrance plates shall be provided on the top of the enclosure. All external connections shall be made to terminal boards.

3.5.6 Fuses.- Fuses shall be provided on the front panel for the primary power circuits to the amplifiers and the tape transport mechanism. Both lines of the 115 v.a.c. supply shall be fused.

3.5.7 Identification plate.- An identification plate shall be provided for the recorder-reproducer set.

3.5.8 Radio interference.- The equipment shall meet the requirements of MIL-I-17623.

3.5.9 Audio electrical noise.- The signal used for tape end warning shall not be recorded on the tape during the recording process nor shall it be audible in the audio channels when playing back a recorded tape.

3.5.10 Physical layout.- The recorder-reproducer shall be of the door-type construction. The tape transport mechanism, controls, indicator meters, and individual channel amplifiers shall be mounted on a front panel which is designed to open out for accessiblity in servicing. Another door, with a clear transparent panel, shall cover only the transport section and be sufficiently large to enable viewing the head assembly, tape drive mechanism, and enough of both take-up and supply reels to permit determining the amount of tape left on the reels. The mechanical door latch for the clear transparent panel shall be a spring loaded type, unless otherwise approved by the Bureau or agency concerned, and shall not open, when the recorder is subjected to the vibration requirement specified in 3.4.22.

3.5.11 Controls.- All speed and mode controls shall be located on the front panel of the recorder, and shall be of the back-lighted push-button type. One of the speed and one of the mode buttons shall be lighted at all times to indicate mode of operation, when the main power switch is in the "on" position. When the recorder-reproducer is recording and playing back simultaneously, both the record and playback control buttons shall be lighted. A control shall be provided on the back of the front panel for varying the illumination level of the push buttons.

3.6 Tape transport.- The tape transport shall meet all specification requirements when handling 1/2-mil tensilized polyester film base tape, and 1-mil and 1-1/2-mil polyester film or cellulose acetate base tape.

3.6.1 Motors.- The equipment shall have three motors. One shall drive the capstan, the other two shall be used to drive the tape reels.

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3.6.1.1 Capstan motor.- The capstan drive motor may be a direct current (d.c.) motor. If a d.c. motor is used, the motor brushes shall have a minimum continuous operating life of 500 hours. The brush replacement shall be convenient and simple to accomplish.

3.6.1.2 Take-up and supply motors.- Take-up and supply motors may be either alternating current (a.c.) or d.c. motors. If d.c. motors are used, they shall be identical. Concentrically mounted reels shall not be used. Requirements for materials included in this specification do not apply to the motors, but the motors are required to meet the temperature, humidity, and all other requirements of this specification.

3.6.2 Speed selector.- The speed selector control shall consist of a back-lighted push button for each speed. These push buttons shall be mounted on the front panel of the recorder-reproducer.

3.6.3 Start time.- The recorder shall attain stable tape speed, for all speeds, within 5 seconds after operation of the "play" button. The start time is defined as that time required, after operation of the "play" button, for the recorder to be at the selected speed, and to meet the flutter requirements of 3.6.5.

3.6.4 Stop time.- With the recorder operating at 30 i.p.s., the recorder shall come to a complete stop within 3 seconds after operation of the "stop" button.

3.6.5 Flutter.- Flutter shall not exceed 0.4 percent peak-to-peak, 0 to 3,000 cycles during any portion of a reel (except for the first and last 5 seconds on a reel of tape) while being subjected to the vibration test specified in 4.5.5. Flutter shall not exceed 0.35 percent peak-to-peak, 0 to 3,000 cycles, when bench tested (no external vibration) as specified in 4.5.5.

3.6.6 Safety switch.- A switch shall be provided which will stop the tape transport in case of tape breakage or end of reel.

3.6.7 Record and playback head mounting.- Tape guides and record and playback heads shall be rigidly and individually mounted on a flat base plate. The recording head gaps and playback head gaps shall be perpendicular to the base plate surface to within 1 minute of arc. The tape guides shall be so located that the tape is guided past the heads parallel to the base plate.

3.6.8 Tape drive.- If required, the tape drive capstan may be replaceable with the head mounting plate. The length of tape being recorded or played back shall be isolated from the tape supply and take-up system, and shall be as short as possible.

3.6.9 Tape path.- The transport shall be designed to facilitate simple threading of the tape. There shall be no sharp corners or edges on or about the surface of the tape transport on which the tape might catch and tear or which might result in an operational hazard for the operator. The tape threading operation shall be accomplished in a simple straight forward manner, with a minimum of opportunities for the unskilled operator to misinterpret the threading procedure. An outline of the threading path shall be provided on the front panel.

3.6.10 Design for servicing.- The recorder-reproducer shall be designed so that servicing of all parts can be easily and quickly performed from the front.

3.7 Amplifier assembly.-

3.7.1 Amplifier construction.- Individual assemblies shall be provided for each channel, and shall contain all electronics, with the exception of the power supply and the bias circuitry (if desired), necessary for recording and playing back the input signals. These assemblies shall be mounted on the front panel of the recorder-reproducer, and shall be interchangeable and readily replaceable. The face of the amplifier assembly shall contain the record level indicator, record level control, playback level control and meter position switch (see 3.4.12). Seven amplifier assemblies shall be provided as specified (see 6.2). Guide rails shall be used to position the amplifier assemblies, and each assembly shall be positively retained in its position. Amplifier and oscillator components shall be mounted on circuit boards using type C terminations in accordance with MIL-STD-275. Each amplifier card shall have conveniently located test points, when the electronic section is opened, for simple servicing.

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3.7.2 Frequency response.-

3.7.2.1 Direct record.- The frequency response of the recorder-reproducer shall not vary more than plus or minus 2 db over the frequency ranges, and at the tape speeds given in table III, when tested in accordance with 4.5.3.1.

Table III - Direct record frequency response.

Speed	Frequency response
(i.p.s.)	(c.p.s.)
3.75	40-7,500
7.5	40-15,000
15	50-30,000
30	50-60,000

3.7.2.2 FM record.- The frequency response of the recorder-reproducer shall not vary more than plus or minus 1/2 db over the frequency ranges, and at the tape speeds given in table IV, when tested in accordance with 4.5.3.2.

Table IV - FM record frequency response.

Speed	Frequency response
(i.p.s.)	(c.p.s.)
3.75	625
7.5	1,250
15	2,500
30	5,000

3.7.3 Signal-to-noise.-

3.7.3.1 Direct record.- The overall signal-to-noise ratio shall be not less than 35 db, when tested in accordance with 4.5.4. The per cycle signal-to-noise ratio shall be not less than 75 db, when tested in accordance with 4.5.4.1.

3.7.3.2 FM record.- The signal-to-noise ratio shall be not less than 40 db, when tested in accordance with 4.5.4.

3.7.4 Distortion.-

3.7.4.1 Direct record.- The overall distortion of the output shall not exceed 2 percent for the direct record inputs, when measured in accordance with 4.5.2.

3.7.4.2 FM record.- The overall distortion of the output shall not exceed 1 percent for the FM record inputs, when measured in accordance with 4.5.2.

3.7.5 Equalization.- The direct record amplifiers shall be equalized on the basis of equal energy supplied to the record head at any frequency.

3.7.6 Level control linearity.- For equal angles of rotation, the attenuation provided by the level controls shall be essentially equal in db throughout at least 80 percent of the control rotation.

3.7.7 Microphone voltage.- To allow the use of microphones which require power, 10-volt, 10-milliampere filtered direct current shall be made available on the terminal board of the equipment.

3.7.8 Capstan motor speed control amplifier.- Facilities shall be provided to control the playback speed of the capstan motor to compensate for changes in tape dimension. This speed control system may use one of the seven basic channels for the recording of a speed reference signal.

3.7.9 Channel isolation.- The crosstalk between any two channels shall be not greater than minus 35db when tested in accordance with 4.5.6.

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3.8 Electrical requirements.-

3.8.1 Electrical components.- Electrical components shall consist of the following:

3.8.1.1 Capacitors.- Electrolytic capacitors in accordance with MIL-C-62 may be used in filter circuits and signal decoupling applications only. Tantalum capacitors shall be used in all cases where capacitor failure would result in signal loss.

3.8.1.2 Transformers.- Transformers shall be grade 4 class S, life expectancy X in accordance with MIL-T-27.

3.8.1.3 Rectifiers.- All rectifiers shall be of the silicon diode type, and shall be chosen from approved types listed in MIL-STD-701.

3.8.1.4 Transistors.- Transistors shall be used for all amplifiers and oscillators. Transistors shall be approved types chosen from MIL-STD-701.

3.8.1.5 Potentiometers.- Subminiature potentiometers may be used for internal adjustment controls.

3.8.1.6 Relays.- All relays used shall have bifurcated contacts.

3.8.1.7 Resistors.- Resistors used in power applications may be of miniature type. Deposited carbon resistors may be used where low noise characteristics are required.

3.9 Physical durability.-

3.9.1 Rough handling.- All parts of the equipment shall be designed to have no critical adjustments such that normal rough handling and shipment will not necessitate readjustment.

3.10 Designation and marking.- In addition to the designation and marking requirements of MIL-I-983, all controls shall be permanently marked to indicate function.

3.11 Painting.- The painting requirements of MIL-I-983 shall apply to exposed metallic surfaces.

3.12 Accessories.- The following accessories shall be furnished:

(a) One standard commercial alignment tape used in final checkout of the equipment.
(b) One 10-1/2-inch reel (empty).
(c) One hand-held head demagnetizer (to operate from 115 volts, 60 cycles).
(d) One commercial tape splicer.
(e) Test circuit boards or test cables to be stored internally in the recorder.

4. QUALITY ASSURANCE PROVISIONS

4.1 Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. 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.

4.2 Preproduction inspection.- Preproduction inspection shall consist of the examination and tests specified in table V, performed in the order listed.

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Table V - Preproduction inspection.

Inspection	Requirement paragraph	Test paragraph
General examination	3.3	MIL-I-983
Operating		4.5.1
Supply line voltage and frequency variation	3.3	MIL-I-983
Tape speed	3.4.4, 3.4.5 and 3.4.6	4.5.7
Output power and distortion:		
Direct record	3.7.4.1	4.5.2
FM record	3.7.4.2	4.5.2
Frequency response:		
Direct record	3.7.2.1	4.5.3.1
FM record	3.7.2.2	4.5.3.2
Signal-to-noise		
Direct record	3.7.3.1	4.5.4, 4.5.4.1
FM record	3.7.3.2	4.5.4
Flutter	3.6.5	4.5.5
Channel isolation	3.7.9	4.5.6
Input impedance	3.4.15	4.5.8
Input voltage range	3.4.16	4.5.9
Equalization	3.7.5	4.5.12
Level control linearity	3.7.6	4.5.11
Mechanical requirements	3.5	4.5.10
Start and stop time	3.6.3, 3.6.4	4.5.13
Radio frequency noise interference	3.5.8	MIL-I-17623
Airborne noise	3.3	MIL-I-983
Structureborne noise	3.3	MIL-I-983
Temperature and humidity	3.3	MIL-I-983
Inclination	3.4.22	MIL-I-983
Accelerated life	3.4.1	4.5.14
Enclosure	3.3	MIL-I-983
Rough handling	3.9.1	4.5.15
Vibration	3.4.22	MIL-I-983
Shock	3.4.22	MIL-I-983

The results of each test shall be compared with the specification requirements. In the event of failure to conform to this specification, the contractor shall correct the cause of failure in the preproduction sample and on future production units.

4.3 Sampling for quality conformance inspection. -

4.3.1 Inspection lot. - All equipment presented for delivery at one time shall be considered a lot. The lot may include the entire contract quantity or it may be the production of any convenient time period.

4.3.2 Group A. - All equipment covered on the contract or order shall be subjected to the group A examination and tests listed in 4.4. The results of each test shall be compared with specification requirements. In the event of failure to conform to this specification for any examination or test, the contractor shall correct the cause of failure on future production units and repair the deficiency in all equipments produced on the contract or order.

4.3.3 Sampling for group B tests. - A sample of equipments shall be selected from each inspection lot in accordance with table VI, and shall be subjected to each of the group B tests listed in 4.4. The results of each test shall be compared with specification requirements. Failure to conform to the specification requirements for any test shall be counted as a defect and the equipment shall not be offered for delivery. If the number of nonconforming equipments in any sample exceeds the acceptance number for that sample, this shall be cause for rejection of the lot represented by that sample.

4.3.4 Sampling for group C tests. - Group C tests will be required by the bureau or agency concerned when the basic design of the equipment or the material of a vital part has been changed. One complete equipment shall be selected and subjected to each of the group C tests listed in 4.4. The results of each test shall be compared with specification requirements. In the event of failure to conform to this specification for any group C test, the contractor shall correct the cause of failure on future production units and repair the deficiency in all equipments produced on the contract or order.

4.4 Quality conformance inspection. - The sample equipment selected in accordance with 4.3 shall be subjected to the tests listed in table VII. Tests shall be performed, in general, in the order listed.

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Table VI - Sampling for group B tests.

Number of equipments in inspection lot	Number of equipments in sample	Number of equipments nonconforming to any group B test	
		Acceptance number	Rejection number
3 and under	all	-	-
4 to 15	3	0	1
16 to 40	5	0	1
41 to 110	7	0	1
111 to 300	10	0	1
301 to 500	15	1	2
501 and over	25	2	3

Table VII - Quality conformance inspection.

Inspection	Requirement paragraph	Test paragraph
Group A		
General examination	3.3	MIL-I-983
Operating		4.5.1
Group B		
Supply line voltage and frequency variation	3.3	MIL-I-983
Tape speed	3.4.4, 3.4.5 and 3.4.6	4.5.7
Start and stop time	3.6.3, 3.6.4	4.5.13
Output power and distortion		
Direct record	3.7.4.1	4.5.2
FM record	3.7.4.2	4.5.2
Frequency response		
Direct record	3.7.2.1	4.5.3.1
FM record	3.7.2.2	4.5.3.2
Signal-to-noise		
Direct record	3.7.3.1	4.5.4, 4.5.4.1
FM record	3.7.3.2	4.5.4
Channel isolation	3.7.9	4.5.6
Flutter (non-vibrational)	3.6.5	4.5.5
Equalization	3.7.5	4.5.12
Level control linearity	3.7.6	4.5.11
Group C		
Mechanical requirements	3.5	4.5.10
Structureborne noise	3.3	MIL-I-983
Shielding and radio frequency noise	3.3	MIL-I-983
Airborne noise	3.3	MIL-I-983
Temperature and humidity	3.3	MIL-I-983
Inclination	3.3	MIL-I-983
Accelerated life	3.4.1	4.5.14
Enclosure	3.3	MIL-I-983
Vibration	3.4.22	MIL-I-983
Shock	3.4.22	MIL-I-983
Flutter (vibrational)	3.6.5	4.5.5
Rough handling	3.9.1	4.5.15

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4.5 Test procedures.- Tests shall be conducted with voltage at 115 volts, 60 cycles, single phase being supplied to the recorder-reproducer.

4.5.1 Operating test.- The operating test shall consist of recording and reproducing a signal through each of the seven channels of the recorder reproducer. All controls, local and remote, shall be actuated to determine that they are functioning properly.

4.5.2 Output power and distortion.- Output power and distortion shall be measured using a signal generator having an output distortion content of less than 0.3 percent. Input signals of an amplitude equal to the maximum and minimum input levels shall be recorded at 7.5 i.p.s. through each channel and for each of the types of input. These signals shall have frequencies of 40,100, 1,000, and 15,000 c.p.s. while recording on direct record and 20, 200, and 1,250 c.p.s. while recording on FM record. The record level controls shall be set at the positions which produce an indication of optimum recording level on the record level indicators. The tape shall then be played back with the playback level control adjusted to give 1 volt across a 600-ohm load, and the output and distortion measured on each channel for each type of input at 7.5 i.p.s. to determine conformance with 3.7.4 and 3.4.17.

4.5.3 Frequency response.- The frequency response for each channel shall be measured with maximum input level being supplied to the bridging inputs, and with the record level controls set for optimum recording level.

4.5.3.1 Direct record input.- The frequency of the input signal shall be continuously varied over a range of 40 to 7,500 c.p.s. while recording at 3.75 i.p.s., 40 to 15,000 c.p.s. while recording at 7.5 i.p.s., 50 to 30,000 c.p.s. while recording at 15 i.p.s. and 50 to 60,000 c.p.s, while recording at 30 i.p.s. The tape shall be reproduced with the output level control set to provide an output of 1/2 volt across a 600-ohm load at 1000 c.p.s. Measurements shall be made across the 600-ohm load to determine conformance with 3.7.2.1.

4.5.3.2 FM record input.- Signals with frequencies of 0.1, 2.5, 20, 100, 200, 750, 1250, and 2500 c.p.s. shall be recorded at a speed of 15 i.p.s. The tape shall be played back with an output of 1/2 volt across a 600-ohm load at zero frequency. Measurement shall be made across the 600-ohm load to determine conformance with 3.7.2.2.

4.5.4 Signal-to-noise (overall).- A 50-c.p.s. signal shall be recorded through the direct record and FM record bridging input of each channel at 7.5 i.p.s. at levels equal to the minimum input levels with the record level control adjusted for optimum recording level. The tape shall then be reproduced with the reproduce level control adjusted to give an output of 1 volt across a 600-ohm load. The recorded portion of the tape shall then be erased by the recorder-reproducer while recording with no input signals. The erased portion of the tape shall then be reproduced with the reproduce level controls set at the same position as when the recorded signals were reproduced. The noise level shall be measured across a 600-ohm load and expressed in db relative to 1 volt to determine conformance with 3.7.3.1 and 3.7.3.2.

4.5.4.1 Signal-to-noise (per cycle).- With the reproduce level controls set at the same positions as in 4.5.4, the erased portion of the tape shall again be reproduced (see 4.5.4). The noise level shall be measured across a 600-ohm load and fed through a high resolution filter to the output db meter. The signal-to-noise per cycle shall be measured at 60, 120, 180, 240, and 300 c.p.s. for conformance with 3.7.3.1. If a per cycle resolution filter is not available, a General Radio 736A Wave Analyzer (or equal) may be used for this measurement. With the bandwidth set for 4 cycles, the signal-to-noise ratio shall be not less than 69 db.

4.5.5 Flutter.- While being subjected to the vibration tests required by MIL-I-983, flutter shall be measured to determine conformance with 3.6.5. The method of testing shall be as follows: With the recorder speed at 7-1/2 i.p.s., a 10,000-c.p.s. signal shall be recorded through the direct bridging input, of any one channel, at optimum record level. The recorded signal shall then be reproduced, detected in a discriminator, and shall appear on an oscilloscope face as peak-to-peak flutter. The scope face shall be photographed for a permanent record and for later analysis. The oscilloscope (Tektronix Model 535 or equal) at the discriminator output (Electro-Mechanical Research Discriminator, Model 1890, or equal) shall be calibrated to read a percentage of peak-to-peak flutter by deviating the carrier a known percentage and observing the CRT spot displacement. The method of testing for bench test flutter in the recorder is identical to the above with the exception that the recorder is not subjected to external vibration.

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4.5.6 Channel isolation.- A 50-cycle signal at maximum input level shall be recorded at a speed of 7-1/2 i.p.s. through three adjacent channels with the record level controls set for the optimum recording level. The center channel shall be set for FM record line input, and the other two adjacent channels set for direct record bridging input. The tape shall then be reproduced and the reproduce level controls set to give rated output. With the level controls and input switches unchanged, a 50-c.p.s. signal shall be supplied to only the FM record line input channel, and recorded at a speed of 7-1/2 i.p.s. The tape shall be reproduced and the output of the other two channels shall be monitored for conformance with 3.7.9. If no FM modules are required (see 6.2), a 50-cycle direct record microphone input shall be recorded on the center channel in lieu of the 50-cycle FM record line input. A 20,000-cycle signal at maximum input level shall be recorded at a speed of 15 i.p.s. through the direct record bridging input of three alternate channels at optimum recording level. (These channels shall all be from one record head stack and are adjacent channels in one record stack but alternate channels on the tape.) The tape shall be reproduced and the reproduce level controls set to give rated output. With the level controls unchanged, a 20,000-c.p.s. signal shall be supplied to the direct record bridging input of only the center channel and recorded at 15 i.p.s. The tape shall be reproduced and the output of the other two adjacent channels (in one head stack) shall be monitored for conformance with 3.7.9.

4.5.7 Tape speed.- Tape speed shall be measured for conformance with 3.4.4, 3.4.5, and 3.4.6.

4.5.8 Input impedance.- The input impedances shall be measured for conformance with 3.4.15.

4.5.9 Input voltage range.- The input voltage range shall be measured for conformance with 3.4.16.

4.5.10 Mechanical requirements.- The mechanical parameters shall be measured for conformance with 3.5 through 3.5.11.

4.5.11 Level control linearity.- The linearity of the level controls shall be measured for conformance with 3.7.6.

4.5.12 Equalization.- Equalization of the direct record amplifiers shall be measured (by measuring record head current) for conformance with 3.7.5.

4.5.13 Start and stop time.- The recorder start and stop time shall be measured for conformance with 3.6.3 and 3.6.4.

4.5.14 Accelerated life.- The recorder-reproducer shall be operated continuously for 15 days in the following manner: Record and simultaneously playback at 7-1/2 i.p.s. a single frequency signal on each channel for 8 hours (one working day). Then place the recorder-reproducer in the standby mode with the 30 i.p.s. speed selected (the recorder is on but not in a particular operational mode) for the full remainder of the day. This entire process shall be repeated until the completion of the life test. For 1 hour in each week, in the above tests, the recorder shall be continuously switched from the fast forward operational mode to the rewind operational mode. Upon completion of this entire test, the equipment shall be retested for conformance with 3.6.5 and 3.7.2 (see 4.5.5 and 4.5.3).

4.5.15 Rough handling.- The equipment packed for normal shipment shall be held 24 inches above a concrete floor and dropped as follows:

(a) Once on a bottom corner.
(b) Once on the opposite top corner.
(c) Once on the bottom face.

The equipment shall then be unpacked and the operating test specified in 4.5.1 performed to determine conformance with 3.9.1.

5. PREPARATION FOR DELIVERY

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

5.1.1 Recorder-reproducer set.-

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5.1.1.1 Preservation and packaging.- Preservation and packaging 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 and will afford protection against physical and 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 Rules and Regulations or other carrier regulations as applicable to the mode of transportation.

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, contract or order number, contractor's name and destination.

5.1.2 Shipboard repair parts.- The shipboard repair parts shall be preserved and packaged level A; packed level C, and marked level A or C, respectively, in accordance with MIL-E-17555.

5.2 Domestic shipment and storage or overseas shipment.- Where special requirements not covered by 5.1 above, are required, the levels of preservation, packaging, packing and marking for shipment shall be specified by the procuring activity (see 6.2).

(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 (see 6.2).

5.2.1.1 Preservation, packaging, packing, and marking.- The equipment and accessories, repair parts and technical publications shall be preserved and packaged level A or C; packed level A or B, as specified (see 6.2), and marked in accordance with MIL-E-17555.)

6. NOTES

6.1 Intended use.- The AN/UNQ-8 recorder-reproducer is intended for Naval service where it is expected to withstand continuous use for long periods under Military service conditions.

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

(a) Title, number, and date of this specification.
(b) Quantity of recorder-reproducer sets required.
(c) Quantity of magnetic tape required (see 3.4.2).
(d) Quantity of direct and FM amplifier assemblies required (see 3.7.1 and 4.5.6).
(e) Quantity of manuals required (see 3.3 and MIL-M-15071).
(f) Preservation and packaging, packing, and marking information if other than specified in 5.1 (see 5.2).

6.3 Preproduction.-

6.3.1 Invitations for bids should provide that the Government reserves the right to waive the requirement for preproduction samples as to those bidders offering a product which has been previously procured or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending procurement.

6.3.2 One sample of the recorder-reproducer will be furnished to a laboratory satisfactory to the bureau or agency concerned for the tests specified in 4.2.

Notice.- When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation the United States Government thereby incurs no responsibility or any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be

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SPECIFICATION ANALYSIS SHEET
NAVSHIPS-4863 (8-61)

INSTRUCTIONS

BUDGET BU. NO. 45-R309

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 Bureau of Ships

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 dotted lines on reverse side, staple in corner, and send to Bureau of Ships, Specifications and Standardization Branch, Washington 25, D.C.

SPECIFICATION

ORGANIZATION	CITY	STATE

CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT
		$

MATERIAL PROCURED UNDER A DIRECT GOVERNMENT CONTRACT ☐ OR A 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 THE ANSWER IS "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification.)* PLACE THIS FORM AND PAPERS IN AN ENVELOPE AND SEND TO THE BUREAU.

SUBMITTED BY *(Print name and activity)*	DATE

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