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COMMERCIAL ITEM DESCRIPTION

AMPLIFIERS, AUDIO FREQUENCY; AND AMPLIFIER-CONTROL GROUPS-SHIPBOARD ANNOUNCING

The General Services Administration has authorized the use of this commercial item description as a replacement for MIL-A-21577A which is canceled.

1. **Scope**. This Commercial Item Description covers audio frequency amplifiers and controls, shipboard announcing type, for use aboard Naval ships. The above amplifiers are to be employed as units in shipboard announcing systems which disseminate alarm signals, commands, and information as required in the tactical operation of Naval surface ships and submarines.

2. **Salient characteristics**.

2.1 **Specification sheets**. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this Commercial Item Description and the specification sheet, the latter shall govern.

2.2 **Description**. The equipment shall consist of amplifier assemblies, or amplifier-oscillator assemblies including control facilities, such as switches and relays, mounted in racks or enclosures.

2.3 **General characteristics.**

2.3.1 **Prohibited materials**. The materials listed below shall not be used in the construction of Audio Frequency Amplifiers.

(1) Flammable materials
(2) Wood
(3) Asbestos; asbestos compounds; and asbestos-filled molding compounds
(4) Lithium and lithium compounds
(5) Magnesium or magnesium alloy

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(6) Zinc or zinc alloy
(7) Carcinogens
(8) Radioactive material
(9) Polychlorinated Biphenyl (PCB)
(10) Polyvinyl Chloride (PVC), except where used for component leads
(11) Mercury or its compounds and amalgams
(12) Cadmium
(13) Chloroflourocarbons

2.3.2 **Inert materials**. All materials shall be fungus inert or shall be suitably treated to retard fungus growth. The manufacturer shall certify that all external materials are fungus resistant or shall test the material in accordance with ASTM G21. There shall be no evidence of fungus growth on the surfaces of amplifier components.

2.3.3 **Metal parts**. Metal parts shall be of a corrosion-resisting material or of a material given a corrosion-resistant coating or treatment. Material selection shall consider the minimization of bimetallic corrosion.

2.3.4 **Aluminum alloys**. Aluminum alloys shall conform to applicable NSTM standards.

2.3.5 **Non-ferrous metals**. Non-ferrous metals shall conform to commercial standards.

2.3.6 **Thermoplastic materials**. Plastics which melt or soften under test conditions imposed by this product description shall not be used.

2.3.7 **Ceramics**. Use of ceramics requires the procuring activitiy's approval.

2.3.8 **Glass**. All glass for use in units for protection of meters and for viewing dials and indicators shall be clear, presenting no evidence of distortion when viewed from any angle.

2.3.9 **Painting**. Enclosures shall be completely painted in accordance with best commercial practices. Plastic and composite materials normally will not be painted. Exterior enclosure color shall be gray.

2.3.10 **Fasteners**. Fasteners shall conform to FED-STD-H28.

2.3.11 **Input power**. This equipment shall operate from nominal 115 volt AC, 60 hertz. Voltage tolerance shall be ±6 volts (V). Frequency tolerance shall be ± 3 cycles per second (Hz).

2.3.12 **Power transients**. Equipment design shall be such that under any mode of operational switching of the equipment, including on or off, or with an input supply over voltage of 300 percent for a period of 1 millisecond, the output voltage of the equipment power supply (or supplies) shall not vary by more than 20 percent. This capability shall be verifiable by superimposing a one millisecond pulse of 300 percent overvoltage onto the supply voltage. The output of the equipment's power supplies shall be observed on a calibrated oscilloscope, while the equipment is switched through all operational modes to determine conformance.

2.3.12.1 **Power transient regulation in percent of nominal**.

(a) Voltage. Plus or minus 18 percent outside of steady state band. Recovery within 3 percent of steady state band in 2 seconds.

(b) Frequency. 3 percent dip of which no more than 1 percent is outsidesteady state band. Recovery within statdy state band in 2 seconds. Approximately one-half of the voltage dip shall occur within the first one-half cycle after initiation of the disturbance. Minimum voltage shall occur in 0.1 to 0.3 second. After the maximum negative voltage excursion, the voltage shall overshoot to a maximum value which can be as great as the negative excursion. The total period of this transient shall not exceed a total time period greater than 2 seconds.

2.3.12.2 **Power supply harmonic content**. The equipment shall perform satisfactorily when the power supply contains harmonics of the following values: total harmonic content of not more than 5 percent and maximum of any one harmonic of 2 percent.

2.3.13 **Indicator lights**. Indicator light globes or lenses shall conform to the following color scheme:

Yellow	Open.
Amber	Abnormal but not immediately dangerous condition.
Blue	Closed (shut).
Green	Normal
Red	Dangerous or emergency condition.
White	Power on or power available.

For equipment in spaces where dark adaptation of personnel is required, indicators with red lenses and stencil-type markers discs shall be used.

2.3.14 **Fuses**. Glass type fuses shall not be used.

2.3.15 **Fuseholders**. Fuzeholders shall be of the indicating type, with indicator illumination ceasing when the fuze opens.

2.3.16 **Enclosure mounting**. The design shall provide for three point suspension for bulkhead mounting, and three or four point suspension for panel mounting. The three mounting feet for bulkhead designs shall provide two feet at the top and one foot at the bottom. The method of mounting on panels shall incorporate design features whereby the flange of the case and shall be so arranged that the entire interior subassembly can be withdrawn from its case without disturbing the panel mounting bolts.

2.3.17 **Size**. No unit may be over 183 centimeters (cm) overall height as installed. Any unit, when uncrated for installation and without further disassembly, shall be capable of passage through doors and hatches. For equipment destined for surface ships, this requires passage through a door 66 cm wide by 114 cm high (reduced by round corners on a 20.3 cm radius), and through a hatch 76 cm long by 76 cm wide (reduced by round corners on an 11.4 cm radius). For equipment destined for submarines, this requires passage through a door 50.8 cm wide by 96.5 cm high (reduced by round corners on a 25.4 cm radius) and through a circular hatch 63.5 cm in diameter.

2.3.18 **Rounded corners and edges**. All edges and corners of external surfaces, normally exposed or to be painted, shall be rounded. Sharp edges and points of any kind shall be avoided.

2.3.19 **Internal subassembly protection**. Complete unit internal subassemblies shall be provided with means to prevent injury to pointers, dials, and other parts when the subassembly is removed from its enclosure and rested on a work bench on either its top or bottom.

2.3.20 **Temperature**. The operating temperature limits shall be -20 degrees

centigrade (°C) to +50°C. The non-operating temperature limits shall be -40°C to +70°C, for unsheltered shipboard use.

2.3.20.1 **Non-operating temperature**. The units shall meet the performance requirements of this commercial item description after exposure to low temperature for 1 hour and high temperature for 2 hours, with the non-operating temperature values specified above.

2.3.20.2 **Operating temperature**. The units shall satisfy the following high and low operating temperature tests:

2.3.20.2.1 **Operating high temperature**. The units shall meet the performance requirements of this commercial item description while at the high operating temperature (± 1°C) specified above for 1 hour. The relative humidity shall be maintained at less than 20 percent. After exposure to high operating temperature, the units shall satisfy the requirements of this commercial item description after 1 hour or more at room temperature.

2.3.20.2.2 **Operating low temperature**. The units shall meet the performance requirements of this commercial item description while at the low operating temperature (± 1°C) specified above for 1 hour. The relative humidity shall be maintained at greater than 85 percent. After exposure to low operating temperature, the units shall satisfy the requirements of this commercial item description after 1 hour or more at room temperature.

2.3.21 **Humidity**. The units shall meet the performance requirements of this commercial item description when subjected to a relative humidity of 100% at 24° to 27°C for three hours.

2.3.22 **Degree of enclosure**. Racks or enclosures shall be dripproof on top. Other surfaces may be open as necessary to promote maximum air circulation for cooling. The top shall be so constructed that water falling from directly overhead cannot enter the enclosure, when tested in accordance with the following procedure: Drips or sprinkles of water shall be allowed to fall over the entire top surface of the enclosure, with the minimum amount of water being 176 liters per square meter of enclosure top surface, in a period of 60 minutes. The dripping or sprinkle rate and distribution shall be approximately uniform. The equipment shall be operating for two thirds of the test period and off for the remainder. Failure of the equipment to operate satisfactorily or accumulation of water within the enclosure shall be cause for rejection.

2.3.23 **Inclination**. Units shall operate satisfactorily when inclined up to 45 degrees from the vertical in any direction for surface ships' equipment and up to 60 degrees from the vertical in any direction for submarine equipment.

2.3.24 **Vibration**. The units shall meet the requirements of this commercial item description during and after the Type III vibration test of EIA RS-186-7, modified to include the frequency range of 1 to 55 Hz vice 10 to 55 Hz. Mounting shall be identical to that intended for service. Test shall be conducted under full electrical load, with all circuits energized. No movement or resetting of switches, relays, or controls shall be evident during or after the course of shock testing.

2.3.25 **Shock**. The units shall meet the requirements of this commercial item description when tested for durability in a shock environment. The shock test procedure shall be agreed upon by the contractor and the government, and may include the following test method. The loudspeaker shall be mounted to a support fixture. The support fixture shall be similar in size, shape, and attachment methods so as to simulate the unit mounting area. Tested items shall be attached to their shock test fixtures in accordance with the manufacturer's installation

drawings. This method of mounting shall reflect the intended shipboard installation. The support fixture, with test sample attached, shall be mounted to an anvil plate which will receive the shock impact. The total weight supported by the shock machine anvil plate (excluding weight of anvil plate itself but including all structure and equipment added to the anvil plate) shall not exceed 250 kg. Practical size limitations shall not be exceeded. The contractor may recommend the use of a nonstandard fixture for approval by the acceptance authority. When the equipment has been mounted for test upon the fixture, its position upon the fixture shall not be changed during the course of the test.

2.3.25.1 **Shock test sequence**. For all items subject to lightweight shock testing, three blows at hammer heights of 30.5 cm, 91.4 cm, and 152.4 cm shall be applied to each of three mutually perpendicular axes of the item being tested. Hammer weight shall be 181.4 kg. This is accomplished by attaching the test item by fixture to an anvil plate and striking the anvil plate by top, back, and side blows. The sequence of the testing may be varied at the discretion of the contracting activity and the contractor. In some cases, it may be more beneficial to conduct a 30.5 cm test in each of the three mutually perpendicular axes, followed by the 91.4 cm tests and then the 152.4 cm tests. The above series of nine blows shall be conducted with the units in operation. Separate items may be substituted for each additional set of nine blows, if desired by the contractor.

2.3.25.2 **Shock fastener inspection**. Exposed bolting, screws, and similar exposed fasteners associated with the tested item may be tightened before each test blow or shot only as necessary to compensate for loosening due to seating-in of mating surfaces, as demonstrated by suitable pre- and post- shock measurements. If it cannot be demonstrated (e.g. by bolt length measurements) that fasteners have not yielded, the fasteners shall not be retightened and subsequent shock blows and performance tests shall be conducted with the fasteners in the as-found condition. Torques for applicable bolting shall be measured and recorded following each shock test blow or shot. Excessive yielding or loosening of fasteners shall be considered as a violation for shock test acceptance criteria. Yielding or loosening of fasteners and yielding or cracking of structural members or component parts shall be reported in shock test reports when such reports are required by the contract or order.

2.3.25.3 **Shock test evaluation**. All shock tested units shall be disassembled and inspected for breakage, deformation, and misalignment. No movement or resetting of switches, relays, or controls shall be evident during or after the course of shock testing.

2.3.25.4 **Shock test administration.** See "Quality assurance provisions" for administrative information on shock testing.

2.3.26 **Safety**. Units shall comply with NFPA 70 and ASTM F-1166 regarding applicable safety features.

2.3.27 **Shielding and radio frequency noise reduction**. The equipment design, construction, and shielding shall be such as to shiled amplifier input circuits and low level contacts from the effects of stray electromagentic and electrostatic fields. The design shall also minimize the generation and prevent the radiation or conduction of radio-frequency energy in excess of the limits specified in NATO STANAG 4436 when tested in accordance with NATO STANAG 4436. Filters shall not be used without the approval of the procuring authority.

2.3.28 **Ground potential and grounding**. All exposed metal parts and chassis shall be at ground (ship's hull) potential at all times. The ship's hull, internal chassis, or unit encolsure shall not be used in lieu of

appropriate electrical conductors in equipment circuitry unless specifically approved by the procuring authority. The leakage current should not exceed 5 milliamperes.

2.4 **Mechanical requirements.**

2.4.1 **Amplifier assemblies and amplifier-oscillator assemblies.**

2.4.1.1 **Definition.** An amplifier assembly or amplifier-oscillator assembly shall consist of a basic amplifier unit or an amplifier-oscillator unit complete with chasis and all parts, intended for mounting within an amplifier rack or enclosure, or within a control rack.

2.4.1.2 **Construction.** The construction shall be such that all wiring terminals shall be accessible for test purposes without requiring removal of an amplifier assembly or amplifier-oscillator assembly from the rack or enclosure in which it is mounted.

2.4.2 **Amplifier and control racks.**

2.4.2.1 **Definition.** An amplifier or control rack shall consist of an assembly of one or more amplifier or amplifier-oscillator assemblies or a combination of amplifier and amplifier-oscillator assemblies, together with control facilities, mounted in a single rack or enclosure.

2.4.2.2 **General construction.** The amplifier rack or enclosure, or control rack shall be designed for deck or bulkhead mounting. Any rack or enclosure exceeding 113 kilograms or 76.2 cm in height shall be designed for deck mounting. All other racks or enclosures shall be designed for bulkhead mounting.

2.4.2.3 **Front servicing.** All racks or enclosures shall be designed to permit complete accessibility to all parts and subassemblies from the front of the enclosure.

2.4.2.4 **Removable covers and doors.** Racks or enclosures shall be provided with removable covers or doors which may be readily opened and removed for servicing or inspection. Covers or doors shall be secured by captive "quick opening" type fasteners capable of being readily unfastened or unscrewed by use of screwdriver, coin, or hand.

2.4.2.5 **Mounting of amplifier and amplifier-oscillator assemblies.** Means shall be provided to sustain the weight of the assembly while the assembly is being mounted in or removed from the rack or enclosure.

2.4.2.6 **Mounting of controls.** All switches, operating controls, test controls and meters shall be mounted on the front of the control rack or panel and shall be visible and accessible without requiring opening of doors or removal of covers.

2.4.2.7 **Terminal boards.** Terminal boards shall be provided in a convenient location, not less than 0.3 meters from the bottom of deck mounted racks, for connection of all ship's cables entering the enclosure. Amplifier racks or enclosures designed for use with a separate control rack or other amplifier racks shall have provisions for inter-rack connections. Where the control rack is separate from amplifier racks all external ship's cables shall be connected in the control rack. Where departure from the above requirements are necessary, specific approval by the procuring authority is required.

2.4.2.8 **Provision for cable entrance.** Removable plates, suitable for drilling to accommodate terminal tubes for cable entrance, shall be provided at

the top of the rack or enclosure. Plates for top cable entrance shall be configured to prevent water, falling from above, from entering the enclosure. Removable plates suitable for drilling, to receive cable clamps shall be installed at the bottom of enclosures for cables entering from the bottom.

2.4.2.9 **Weight limit**. The weight of any single component assembly shall not exceed 57 kg. In the design of large power amplifier assemblies it is permissible to separate the power supply from the amplifier to meet the requirements of this commercial item description.

2.4.2.10 **Forced air cooling**. Amplifier system assemblies shall be designed for operation in the maximum ambient temperatures existing within their rack or enclosures when the ambient temperature surrounding the rack or enclosure is 50°C. However, to prolong the operating life of various components, susceptible to such temperatures, forced air cooling facilities shall be considered in the design and shall be provided when required by the individual equipment specification.

2.4.2.11 **Top bracing**. Deck mounted amplifiers and control racks shall be provided with two side mounting holes near the top and front of the rack for securing top braces when installed aboard ship.

2.5 **Electrical requirements**.

2.5.1 **Reliability**. The Mean Time Between Failure (MTBF) for the equipment, as defined herein, shall be not less than 5,000 hours during operatin environmental conditions.

2.5.2 **Relays**. Relays having contacts which control power in excess of 25 watts, all time delay type relays, and other electromagnetically operated contact making devices shall be capable of 100,000 operations at the highest rate at which they are likely to be operated in service use, but not less than two operations per minute, without requiring repair or servicing. The foregoing requirements shall be complied with while devices are carrying loads they would normally be required to carry in the equipment. The design of relays shall be such that when mounted in their normal position the surfaces of contact springs will be in a vertical plane. Voltage surge suppression features shall be provided for the contacts of relays carrying the primary current of power amplifier plate voltage supply transformers. All relays shall be provided with removable dust-tight covers.

2.5.3 **Amplifier and amplifier-oscillator assemblies**.

2.5.3.1 **Power supply**. Each amplifier or amplifier-oscillator assembly shall be provided with its own power supply for all power requirements of the assembly. The power supply shall be an integral part of each assembly except where the total weight of the assembly, including the power supply, would exceed the limit specified in 2.4.2.9.

2.5.3.2 **Test facilities**. The amplifier module will contain a test oscillator, output dummy load resistor and a test switch for use in periodic testing of the condition of the amplifier circuits. The design will allow operating personnel to test any amplifier module whether active or standby by operating the test switch.

2.5.4 **Amplifier characteristics**.

2.5.4.1 **Microphone stage input impedance**. Input impedance of the microphone stage not including the external series resistors, shall be 85 ohms (plus 10 minus 0 ohms) resistive at any frequency between 200 and 5,000 cycles

per second.

2.5.4.2 **Output voltage**. Amplifier output voltage to loudspeaker systems, when delivering rated output power, shall be 70 volts (plus or minus 4 volts) root mean square (r.m.s.). For amplifiers rated at 500 watts output, or greater, an additional output transformer tap at 95 volts (plus or minus 5 volts) shall be provided.

2.5.4.3 **Output power**. Rated output power for amplifier types shall be as required by the individual equipment specification.

2.5.4.4 **Amplifier gain**.

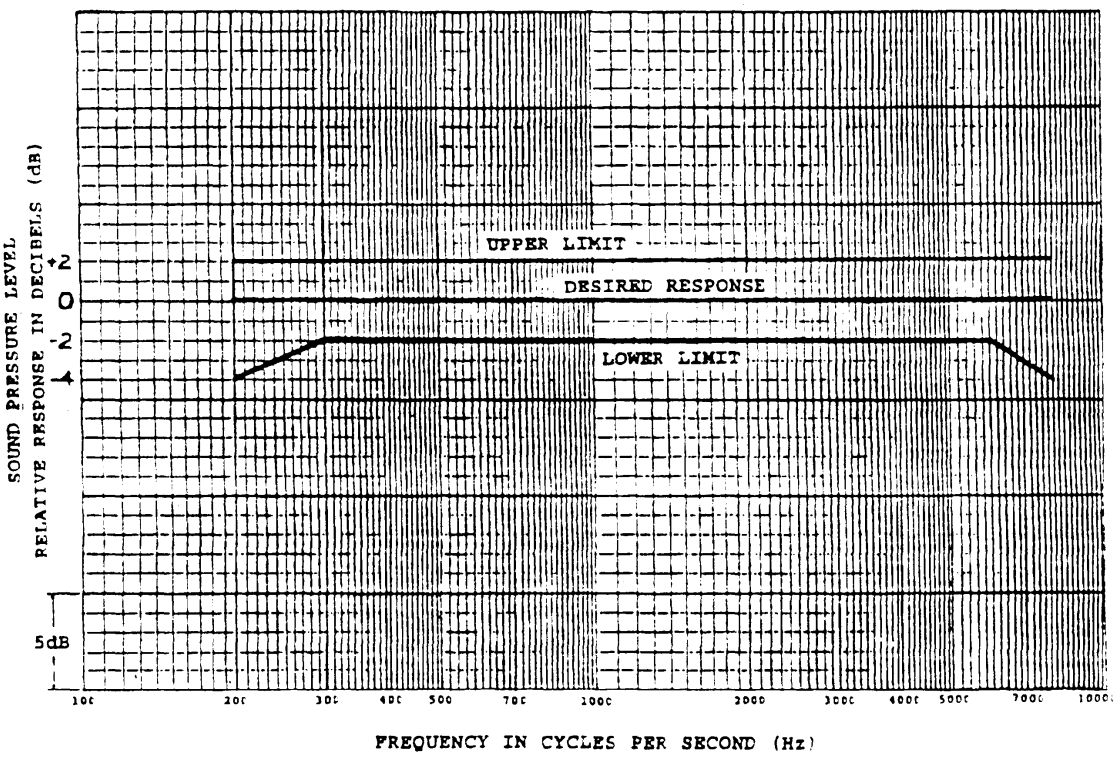

FIGURE 1. Frequency response limits for amplifier equipment.

2.5.4.4.1 **Preamplifier "rated gain"**. With a 1,000 cycle per second sine wave signal of 0.0087 volt r.m.s. applied to the input terminals of the preamplifier through two 39 ohm resistors (one resistor in each side of the line between the 0.0087 volt signal source and the input terminals) the preamplifier shall produce a signal level of 10 volts across the input of the power amplifier or an equivalent resistive load. The foregoing gain setting shall be accomplished by adjustment of the preamplifier's output level control and shall be considered "rated gain".

2.5.4.4.2 **Preamplifier reserve gain**. With the output level control advanced to the maximum output position, the gain of the preamplifier shall increase to a value not less than 10 decibels (dB) greater than "rated gain".

2.5.4.4.3 **Power amplifier gain.** The gain of the power amplifier shall be such that with a 1,000 cycle per sound sine wave signal of 10 volts r.m.s. applied to its input, it will deliver rated output power at rated voltage.

2.5.4.5 **Frequency response.** With the preamplifier set at "rated gain" and with a sine wave signal of 0.0087 volt r.m.s., at frequencies of 200, 400, 1,000, 3,000, and 5,000 cycles per second, applied to its input terminals as specified in 2.5.4.4.1, the output voltage of the power amplifier, measured across a resistive load, shall fall within the limits shown on figure 1. The foregoing requirements shall also apply when the preamplifier output level control is set at maximum output and the test input signal level reduced by an amount sufficient to cause the power amplifier to deliver rated power to the resistive load. The value of the resistive load for the above tests shall be such that it will draw rated power from the power amplifier at rated output voltage.

2.5.4.6 **Distortion.**

2.5.4.6.1 **Distortion at various frequencies.** With the preamplifier set at "rated gain" and with a variable frequency sine wave voltage (of such value as to cause the power amplifier to deliver rated power at rated voltage to a resistive load) applied to the preamplifier input terminals, the maximum harmonic distortion of the power amplifier output measured across the resistive load shall not exceed five percent for input signal frequencies of 400, 1,000, and 6,000 cycles per second. With the input signal frequency set at 200 cycles per second and with its voltage adjusted so that the power amplifier delivers power to the resistive load at a level three dB below rated power, harmonic distortion shall not exceed five percent.

2.5.4.6.2 **Distortion at various input levels.** At rated gain and with a 1,000 cycle per second sine wave signal, voltage applied to the input terminals of the preamplifier specified in 2.5.4.4.1, the total harmonic distortion of the power amplifier output voltage measured across a resistive load (of such value as to draw rated output power at 70 volts) shall not exceed the limits given for the following input voltages:

Input Voltage (volt)	Maximum harmonic distortion (percent)
0.00087 to 0.0087	5
0.0174	10
0.0348	15

2.5.4.7 **Noise and microphonics.** At "rated gain" and with a 150 ohm resistor connected across the 75 ohm preamplifier input terminals, in series with two 39 ohm resistors, the power amplifier output voltage across a resistive load (of such value as to draw rated output power at 70 volts) shall not exceed the following values when measured with an unweighted full range voltmeter. The measurement shall be made under two conditions of test - once while the component is stationary and again while the component is under vibration as specified in 2.3.24

2.5.4.7.1 Component stationary. Maximum measured voltage shall not exceed 0.22 volt r.m.s. (50 decibels below rated output voltage of 70 volts).

2.5.4.7.2 Component under vibration. Maximum measured voltage shall not exceed 1.22 volts r.m.s. (35 decibels below rated output voltage of 70 volts).

2.5.4.8 **Output voltage regulation.** At "rated gain" and with a steady sine wave signal of 0.0087 volt r.m.s. applied to the preamplifier input terminals, as specified in 2.5.4.4.1, a variation of power amplifier output loading from full rated load (a resistive load which will draw rated output power at 70 volts)

to no load (open circuit) shall not cause the output voltage to exceed 99 volts r.m.s. The foregoing requirements shall apply at any frequency between 200 and 5,000 cycles per second.

2.5.4.9 **Isolation against longitudinal voltages**. Longitudinal voltages shall be applied to the preamplifier input terminals in the manner described below and shall bear a ration of not less than 50 decibels to the corresponding voltages required across the normal amplifier input terminals to produce the same amplifier output voltage. A sine wave voltage at a frequency of 1000 cycles per second shall be employed for this purpose. The longitudinal voltages shall be applied and measured as follows:

(a) Between both input terminals and ground (input terminals short circuited).

(b) Between the junction of two 75 ohm resistors, connected in series across the input terminals, and ground.

(c) Between either input terminal and ground (input terminals open circuited).

2.5.4.10 **Stability**. The amplifier shall show no evidences of instability or oscillation when operated with the preamplifier output control set at maximum output with the preamplifier input either short or open circuited and with the power amplifier output either short or open circuited.

2.5.4.11 **Overload capacity**. With the preamplifier set at rated gain and with a 1000 cycle per second sine wave signal applied to its input terminals, as specified in 2.5.4.4.1, the amplifier system shall be capable of operating continuously for a period of 10 minutes with the output of the power amplifier short circuited, without being adversely effected by the overload.

2.5.4.12 **Overload limiter circuit**. The preamplifier portion of amplifier systems shall include circuits to provide the following overload limiter characteristics:

2.5.4.12.1 **Overload limiter characteristics**. With a sine wave signal voltage applied to the preamplifier input terminals the increase in preamplifier output voltage resulting from an increase in the input voltage shall fall within the following limits:

Relative preamplifier input voltage (decibels)	Relative preamplifier output voltage (decibels)
0	0
+6	0 (+1, -0)
+12	0 (+1.5, -0)

Reference output voltage level (0 decibels) is 10 volts measured across the input to the power amplifier or an equivalent resistive load. Reference input voltage level (0 db) is that input voltage required to produce reference output voltage. The foregoing requirements shall apply for frequencies of 500, 1,000, 2,000, and 4,000 cycles per second.

2.5.4.12.2 **Time constant**. Under the conditions specified in 2.5.4.12.1 the preamplifier output voltage shall return to the value specified in 2.5.4.12.1 within 0.001 second after the sudden increase in input signal voltage above reference level. The preamplifier output voltage shall return to reference level in not less than 0.01 second following the sudden reduction of the input signal to reference level.

2.5.4.13 **Amplifier controls.** Amplifier controls shall be provided as follows:

2.5.4.13.1 **Preamplifier output level control.** An output level control shall be provided for the preamplifier. The control shall be of the continuously variable type, adjustable by hand, screwdriver, or coin, and shall be installed in a readily accessible location within the enclosure.

2.5.4.13.2 **Power amplifier input level control.** An input level control shall be provided for power amplifiers which do not contain a preamplifier as part of the same amplifier component. The control shall be of the continuously variable type, adjustable by hand, screwdriver, or coin, and shall be installed in a readily accessible location within the enclosure.

2.5.5 **Alarm amplifier-oscillators characteristics.**

2.5.5.1 **General.** Unless otherwise specified in the individual equipment specification, two amplifier-oscillator assemblies, one to serve as a standby unit for the other, shall be included in amplifier systems having alarm signal requirements. Alarm signals generated by amplifier-oscillators shall be as follows:

Signal number	Signal function
1	Collision alarm
2	Flight crash alarm
3	Diving alarm
4	Chemical alarm
5	General alarm
6	Flight warning alarm
7	Missile launching alarm
8	Unassigned

The alarm signals to be made available in specific amplifier-oscillator assemblies shall be as required by the individual equipment specification for the amplifier system.

2.5.5.2 **General character of signals.** The simulated signals specified in 2.5.5.3 shall be designed to be raucous in character for the purpose of making them as attention arresting as possible. For that reason the use of pure sine waves as components in the make-up signals shall be avoided. All alarm signals may be generated from microprocessor controlled solid state memory. These alarms can be created electronically or recreated through digitally sampled sounds. All alarms signals may reside in permanent memory. The diving alarm shall be recreated from digitally sampled sounds recorded from a motor operated diving horn.

2.5.5.3 **Generated signals.** Closure of the associated control circuits shall cause the following signals to be transmitted from the amplifier oscillator:

Signal number	Character of signal
1	A "pulsed" signal of 1,000 (plus or minus 10) cycles per second with time division characteristics as follows: Each signal "pulse" group shall consist of three "pulses" each of 0.06 seconds duration. The first two "pulses" of the group shall be followed by an "off time" of 0.06 seconds and the third "pulse" shall be followed by an "off time" of 0.3 seconds. This

Signal Number	Character of Signal
	cycle shall be repeated continuously as long as this alarm circuit is actuated.
2	A simulated siren tone signal having its fundamental frequency swept back and forth recurrently over a range of 750 plus or minus 20 to 1,750 plus or minus 100 cycles per second at the approximate rate of 3 seconds for one full sweep.
3	The diving alarm shall be recreated from digitally sampled sounds recorded from a motor-operated diving horn. The signal shall have a basic frequency of 600 plus or minus 100 cycles per second modulated at 120 cycles per second. (The harmonic content of the 600 cycle basic frequency shall be emphasized.)
4	A steady tone signal of 1,000 plus or minus 10 cycles per second.
5	A simulated single stroke gong tone signal, striking at the rate of 100 strokes per minute.
6	A "jump" tone signal alternating between 600 plus or minus 10 and 1,000 plus or minus 10 cycles per second at a rate of 1-1/2 times per second.
7	A "jump" tone signal alternating between 500 plus or minus 10 and 1,500 plus or minus 15 cycles per second at a rate of 1-1/2 times per second.
8	A "jump" tone signal alternating between 600 plus or minus 10 and 1,500 plus or minus 15 cycles per second at a rate of 6 times per second.

2.5.5.4 **Clock frequency.** All alarm frequencies shall be regulated internally or shall be adjustable by a locking screwdriver-type adjustment that is readily accessible within the amplifier enclosure.

2.5.5.5 **Duration of signals.** All signals with the exception of signal number 5 shall be transmitted continuously for as long a period as the corresponding control circuit is closed. Momentary closure of the control circuit for signal number 5 shall cause the signal to be generated for a period of 10 seconds or 15 seconds. A switch for the selection of the 10 or 15 second time intervals shall be readily accessible in the amplifier-oscillator or cabinet in which the amplifier-oscillator is installed.

2.5.5.6 **Output level.** The amplifier-oscillator shall be capable of maintaining an output level of not less than 10 volts into a 600 ohm resistive load for amplifier input. This voltage shall also be used as a test signal source as specified in 2.6.6.4.1

2.5.5.7 **Adjustment of output level.** An adjustment that is moveable by hand, screwdriver, or coin shall be provided in the amplifier-oscillator or in combination with the associated control circuits to permit independent adjustment of the amplifier-oscillator output level for the alarm signal into the amplifier input.

2.5.5.8 **Noise and microphonics.** The character of the alarm signals shall be not adversely affected by the presence of any audible hum or other extraneous noises when those signals are amplified to full output level by an associate power amplifier. This requirement shall be met both with the amplifier-oscillator stationary, and under vibration in accordance with the requirements of 2.3.21.

2.6 **Amplifier and control racks.**

2.6.1 **Introduction.** This section covers the electrical facilities which are required for proper functioning of an amplifier system made up of specified numbers and types of amplifiers and amplifier-oscillator assemblies.

2.6.2 **Amplifier system accommodations.**

2.6.2.1 **Input facilities.** The number and type of all microphone stations or boxes associated with each amplifier system shall be as specified in the individual equipment specification.

2.6.2.2 **Output facilities.** The quantity and individual designations of loudspeaker groups associated with each amplifier system shall be as specified in the individual equipment specification.

2.6.3 **Amplifier system output voltages.**

2.6.3.1 **System output voltage for volume indicator circuits.** The voltage available at the terminals of volume indicator circuits to microphone stations or boxes, corresponding to rated system output voltage, shall be 2.30 volts (plus or minus 0.08 volts) r.m.s. across 600 ohms.

2.6.4 **Operating controls.** There shall be mounted on the front of the control panel or control rack/s, operating controls as follows:

2.6.4.1 **Circuit transfer switches.** All switches and operating controls shall be clearly marked to indicate the switch or control function, and to indicate all active positions or throws. Wherever practicable it will be satisfactory to combine two or more switching functions on a single switch subassembly.

2.6.4.2 **Switch and relay circuits.** Disconnect, transfer and relay switching of all power, input and output circuits shall be accomplished by opening both sides or all phases of the circuits. Single line switching will be acceptable for control circuits only.

2.6.4.3 **Power indicator light.** A white power indicator (pilot) light shall be provided to indicate that electric power is available at the amplifier.

2.6.4.4 **Power switches.** Separate power switches shall be provided as follows:

Each amplifier channel
Each signal generator
Relay circuits

2.6.4.5 **Amplifier input switches.**

2.6.4.5.1 **Active switches.** When the amplifier design is such that more than one microphone station or box can be connected to a common amplifier channel, an amplifier input switch shall be provided for each such station or box, and shall open all circuits to that station or box.

2.6.4.6 **Amplifier transfer switches.**

2.6.4.6.1 **General.** When the amplifier design is such that more than one amplifier channel is employed in a system, amplifier transfer switches shall be provided to disconnect both input and output circuits of a faulty channel (or one being set up for test) and to transfer the combined system functions to the remaining channel or channels. Separate switches, having corresponding positions, may be used for input and output circuits. Those amplifier channels not selected for use shall be disconnected from all operating circuits and shall be available for test purposes, in accordance with 2.6.6.

2.6.4.7 **Amplifier-oscillator selector switches.**

2.6.4.7.1 **General.** Amplifier-oscillator selector switches shall be provided to permit the selection of either assembly for use with the system. The amplifier-oscillator not selected for use shall be disconnected from all operating circuits and shall be available for test purposes, in accordance with 2.6.6.

2.6.4.8 **Amplifier output switches.**

2.6.4.8.1 **General.** When the amplifier design is such that more than one loudspeaker group can be operated from the output of a common amplifier channel, amplifier output switches shall be provided to permit isolation of each loudspeaker group for test or repair purposes.

2.6.4.8.2 **Spare switches.** The quantity of spare amplifier output switches for future system expansion will be specified in the individual equipment specification. These switches shall be connected to terminal boards and shall be wired into the amplifier and control circuits.

2.6.5 **Circuit protective features.**

2.6.5.1 **Amplifier main power circuits.** Both sides of the power circuits feeding each power switch specified in 2.6.4.4 shall be independently fused.

2.6.5.2 **Relay power circuits.** Power to relay and control circuits, which extend beyond the amplifier enclosure (such as circuits to microphone stations or external contact makers) shall be fed through an isolation transformer to minimize the possibility of grounding the ship's power supply as a result of an accidental ground on such circuits. This requirement shall not apply to the external visual alarm circuits specified in 2.6.7.4.

2.6.5.3 **Microphone equipment power circuits.** Where both sides of the power circuit are connected to a microphone station or box, each side of the circuit shall be independently fused.

2.6.5.4 **Microphone audio circuits.** Individual 39 ohm protective resistors shall be connected in series with each side of each microphone audio circuit. These resistors shall be located external to the amplifier assembly, preferably in the control rack. This arrangement provides isolation as well as proper loading for each microphone.

2.6.5.5 **Volume indicator circuits.** Volume indicator circuits to each microphone station or box shall be protected, so that short-circuiting the terminals of any volume indicator circuit shall not affect the amplifier output voltage, and shall not change the voltage at other volume indicator circuit terminals by more than 1 decibel.

2.6.5.6 **Busy indicator circuits.** Busy indicator circuits to microphone

stations or boxes shall be protected by series resistors so that short-circuiting the terminals of any busy indicator circuit shall not affect the relay power-circuit or any of the other busy indicator circuits.

2.6.6 **Test facilities.**

2.6.6.1 **General.** Test facilities shall be provided in the control rack of amplifier systems for the purpose of checking the operation of any amplifier or amplifier-oscillator assembly as an aid to system servicing and maintenance. Test circuits shall be independent of the active audio and control circuits.

2.6.6.2 **Test interlocks.** Circuitry or mechanical interlocks or both shall be provided in the design of amplifiers and controls to eliminate the possibility of sounding alarm signals over loudspeakers when using test facilities to check amplifiers and amplifier-oscillators.

2.6.6.3 **Amplifier-oscillator start switches.** Nonlocking type start switches shall be provided and shall make it possible to start any amplifier-oscillator, under test, transmitting any of its specified signals.

2.6.6.4 **Test signal level meters and test selector switches.**

2.6.6.4.1 **Input metering and switching.** An input level indicating meter and its associated input selector switch or switches shall be provided, and shall make it possible to measure the output of either amplifier-oscillator selected for test, and to connect the output of the selected amplifier-oscillator to the input of any amplifier channel selected for the test.

2.6.6.4.2 **Output metering and switching.** An output level indicating meter, and its associated output selector switch or switches shall be provided, and shall permit measuring the output of any amplifier assembly selected for test.

2.6.6.4.3 **Combined metering.** When required by the individual equipment specification, the metering facilities specified in 2.6.6.4.1 and 2.6.6.4.2 may be combined and a common meter used for amplifier input, amplifier output and amplifier-oscillator output level indication.

2.6.6.5 **Test load resistor and switch.** A nonlocking type switch, normally in the "on" position, and associated test load resistor (of such value as to draw rated output power at 70 volts) shall be provided to permit disconnecting rated load from the output of the amplifier channel being tested.

2.6.6.6 **Test input level control.** A test input level control calibrated in decibels shall be provided for controlling the test signal level of the amplifier-oscillator output (or amplifier channel input) to assist in establishing reference test input levels and to aid in making adjustments. The setting of this control shall be indicated on a fixed scale, suitably marked. Operation of this control shall not affect the system input circuits. The control shall have a range from 12 decibels above reference input level to 28 decibels below reference input level.

2.6.6.7 **Relay test facility.** A relay test facility, for plug-in type relays, consisting of a test socket, indicating lamps and test switch shall be provided. The test facility shall permit testing a relay for operating coil continuity, and for contact operation in both the normal and operated conditions.

2.6.7 **Control facilities.** Control circuits shall be provided to accomplish the following system functions:

2.6.7.1 **Microphone press-to-talk switches**. The operation of a microphone press-to-talk switch at a microphone station or box shall:

(a) Connect the microphone audio circuit at that microphone station or box to the input of the selected amplifier channel.

(b) Apply control voltage to the loudspeaker group selector switches, if required, at that station or box.

(c) Energize appropriate busy indicator circuits.

(d) Actuate appropriate system priority circuits.

(e) Connect the output of the selected amplifier channel to the selected loudspeaker groups.

(f) Disconnect the adjacent loudspeakers on the local loudspeaker circuit associated with that microphone station or box, as specified in 2.6.10.

(g) Cause the output of the Ship's Entertainment System to be reduced to a low level.

2.6.7.2 **Loudspeaker group selector switches**. With the microphone press-to-talk switch operated at a microphone station or box, operation of a loudspeaker group selector switch at that station shall connect the associated loudspeaker group to the output of the selected amplifier channel.

2.6.7.3 **Alarm contact makers**. Operation of an external alarm contact maker (consisting of a single-pole, single throw switch furnished by the installing activity) shall:

(a) Energize appropriate busy indicator circuits.

(b) Actuate appropriate system priority circuits.

(c) Connect the output of the selected amplifier-oscillator to the interstage input of the selected amplifier channel(s).

(d) Connect the output of the selected amplifier channel(s) to all connected loudspeakers, (those loudspeaker groups not actually disconnected by the loudspeaker disconnect switches, specified in 2.6.4.8).

(e) Connect the output of the selected amplifier channel(s) to all connected loudspeakers (those loudspeaker groups not actually disconnected by the loudspeaker disconnect switches, specified in 2.6.4.8).

(f) Apply full rated output voltage to all loudspeaker groups.

2.6.7.4 **Additional functions for specific systems**. For specific amplifier systems, as required by the individual equipment specification, the following additional functions shall be accomplished by the operation of an alarm contact maker:

2.6.7.4.1 **Visual alarm**. Operation of a Signal number 1 or number 4 contact maker shall operate a relay for control of an external visual alarm signal. The relay shall be capable of controlling a resistive load current of 7.0 amperes at 115 volts, 60 cycles, single phase. Operation of a Signal number 5 contact maker shall cause the relay to operate intermittently at the approximate rate of 1/3 second on and 1/3 second off for a period of 10 or 15 seconds.

2.6.7.4.2 **Circuit SE muting.** Operation of a Signal number 1, number 3, number 4, or number 5 contact maker shall operate a relay which, through an external circuit, shall mute the output of the Ship's Entertainment System.

2.6.7.5 **Loudspeaker group selection.** In general, it shall be possible for each microphone station or box (provided with loudspeaker group selector switches) on a particular announcing circuit to select any of the loudspeaker groups associated with that circuit. When required by the individual equipment specification it shall also be possible for microphone stations on one circuit to select loudspeaker groups on other circuits.

2.6.8 **System priorities.**

2.6.8.1 **Alarm signal priorities.** Alarm signals shall have priority over speech from microphone stations or boxes. The order of priority of the various alarm signals shall be as required by the individual equipment specification.

2.6.8.2 **Speech priorities.** Unless otherwise specified in the contract or order, there shall be no priority of speech between microphone stations or boxes on the same announcing circuit. However, when two or more announcing circuits are connected to a common amplifier channel, or when two or more microphone stations, each on a different channel, are able to select the same loudspeaker group, speech priority for the microphone stations involved will be required. Speech priorities shall be as specified in the individual equipment specification.

2.6.9 **Busy indicator circuits.** Busy indicator circuits shall be provided for all amplifier systems, where it is possible to connect more than one microphone station or box to a single amplifier channel. Where more than one announcing circuit is involved, each microphone station or box shall be provided with one busy indicator circuit for each announcing circuit. These busy indicator circuits shall be energized in accordance with the following general principles:

(1) A microphone station or box shall receive a busy indication when the amplifier channel to which it is connected is in use, or when a loudspeaker group which can be selected by that station or box in use.

(2) When more than one announcing circuit is connected to a single amplifier channel, the busy indicator circuits corresponding to these announcing circuits shall be energized simultaneously.

(3) When an alarm signal is being transmitted, all busy indicator circuits involved shall be energized.

2.6.10 **Local loudspeaker cut-out circuit.** A cut-out circuit shall be included for each microphone station or box to automatically disconnect local loudspeakers, on the same system, when the microphone station or box is in use. The cut-out circuit shall consist of a normally closed relay which shall operate to open the audio circuit supplying the local loudspeakers when the microphone press-to-talk switch is operated. Power for operation of the relay shall be taken from the 115 volt, 60 cycle, single phase control power supply available in the microphone station or box. The relay shall be mounted in an enclosure and installed in the vicinity of the microphone station or box.

2.6.11 **Spare control relays.** Additional relays shall be provided in the amplifier system on the basis of one relay of each type for each 25 (or fraction thereof) of that type employed, provided a minimum of five of that type are employed. These spare relays shall be for the purpose of facilitating future

system revisions or modifications, shall be mounted adjacent to the active relays of corresponding type, and shall be left unconnected.

3. **Regulatory requirements**. The offerer/contractor is encouraged to use recovered materials in accordance with Public Law 94-580 to the maximum extent practicable. This shall not be interpreted to mean that the use of used or rebuilt products is allowed under this Commercial Item Description unless otherwise specifically specified.

4. **Quality assurance provisions**.

4.1 **Shock test facilities**. The contractor's equipment and procedure used for shock testing shall be evaluated for adequacy by the government prior to acceptance of the equipment. A listing of currently approved shock testing facilities may be obtained from the Naval Sea Systems Command (Ship Protection Division). Unless otherwise specified by the contracting activity, shock tests shall be conducted at commercial test facilities. If a Government facility is requested, a request shall be prepared.

4.2 **Extension of previous shock test approvals**. The shock test requirement may be satisfied by demonstrating that previously conducted and approved shock tests apply to the item being acquired and provide a basis for acceptance of the item. Shock test extension policies apply to items identical or similar to previously shock tested and approved items, and to items identical to those previously approved on the basis of shock test extension.

4.3 **Contractor certification**. The contractor shall certify and maintain substantiating evidence that the product offered meets the salient characteristics of this Commercial Item Description and that the product conforms to the producer's own drawings, specifications, standards and quality assurance practices. The government reserves the right to require proof of such conformance prior to the first delivery and thereafter as may be otherwise provided for under the provisions of the contract.

5. **Preservation, packaging, packing, labeling, and marking**. The preservation, packaging, packing, labeling, and marking shall be as specified in the contract or order. Packaging shall meet or exceed the standards of ASTM D 3951, Standard Practice For Commercial Packaging.

6. **Notes**.

6.1 **Ordering data**. Ordering documents should include, at a minimum, the following information:

(a) Title, number and date of this Commercial Item Description.

(b) Quantity of items required

(c) Quantity of amplifiers or controls or both comprising an equipment.

(d) Input facilities - quantity, type, location, and associated announcing circuit of all microphone stations and boxes, including spare circuits (see 5.b.(1)).

(e) Output facilities - total quantity, individual designations, and associated announcing circuits of loudspeaker output groups, including spare circuits (see 5.b.(2) and 5.d.(8).(b)).

(f) Supply demand control center for repair parts.

(g) Quantity of repair parts.

(h) Quantity of technical manuals.

(i) Preservation, packaging, packing or marking requirements.

(j) Type of storage for equipment repair parts.

(k) Whether or not technical manuals are to be packed with theequipment.

Preparing Activity:
Navy - SH
(Project 6320-N040)