MILITARY SPECIFICATION

TELEPHONE SETS, TA-970/U, TA-980/U, AND TA-990/U

This specification is approved for use by the Naval Electronic Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the performance, production, and testing requirements for Telephone Sets TA-970/U, TA-980/U, and TA-990/U for use with shipboard secure voice communications systems.

1.2 Classification. The telephone sets shall be of the following types, as specified (see 6.2.1):

a. Type I - TA-970/U. The TA-970/U provides telephone and control capability for one telephone channel only.
b. Type II - TA-980/U. The TA-980/U provides telephone and control capability for one of twelve switch selected telephone channels.
c. Type III - TA-990/U. The TA-990/U provides telephone and control capability for one telephone channel only.

2. APPLICABLE DOCUMENTS

2.1 Government documents. The following documents, of the issue listed in the Department of Defense Index of Specifications and Standards (DODISS) and its supplements, form a part of this document to the extent specified herein. The date of the applicable DoDISS and supplements thereto shall be as specified in the solicitation.

SPECIFICATIONS

MILITARY

MIL-S-901	Shock Tests, H.I. (High-Impact), Shipboard Machinery, Equipment And Systems, Requirements For
MIL-E-16400	Electronic, Interior Communication And Navigation Equipment, Naval Ship And Shore, General Specification For
MIL-E-17555	Electronic And Electrical Equipment, Accessories, And Repair Parts, Packaging And Packing Of
MIL-C-28843	Control, Remote Switching, C-10315/U And C-10979/U

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Electronic Systems Command (ELEX-5043), Washington, D.C. 20360, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

* U.S. GOVERNMENT PRINTING OFFICE: 1981—703-023/3559

STANDARDS

MILITARY

MIL-STD-105	Sampling Procedures And Tables For Inspection By Attributes
MIL-STD-108	Definition Of And Basic Requirement For Enclosures For Electric And Electronic Equipment
MIL-STD-109	Quality Assurance Terms And Definitions
MIL-STD-461	Electromagnetic Emission And Susceptibility Requirements For The Control Of Electromagnetic Interference
MIL-STD-462	Electromagnetic Interference Characteristics, Measurement Of
MIL-STD-471	Maintainability Demonstration
MIL-STD-781	Reliability Design Qualification And Production Acceptance Tests Exponential Distribution
MIL-STD-810	Environmental Test Methods
MIL-STD-965	Parts Control Program

DRAWINGS

MILITARY

NAVAL ELECTRONIC SYSTEMS COMMAND

DL 76E2N100	Data List, Telephone Set TA-970/U
DL 76E3N100	Data List, Telephone Set TA-980/U
DL 78E4N100	Data List, Telephone Set TA-990/U

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

3. REQUIREMENTS

3.1 General. The Type I, Type II, and Type III telephone sets shall be in accordance with MIL-E-16400 to the extent specified herein.

3.1.1 Classification of requirements. The requirements for the Type I, Type II, and Type III telephone sets are classified as follows:

Requirement	Paragraph
First article	3.2
Parts, materials, and processes	3.3
Design	3.4
Reliability	3.5
Construction	3.6
Maintainability	3.7
Performance characteristics	3.8
Environmental requirements	3.9
Electromagnetic interference and electromagnetic compatibility	3.10
Physical requirements	3.11
Color and finish	3.12
Workmanship	3.13

3.2 First article. When specified (see 6.2.1), the contractor shall furnish sample unit(s) for first article inspection and approval (see 4.3 and 6.3).

3.3 Parts, materials, and processes. Parts, materials, and processes used in production of the telephone sets shall conform to the requirements of MIL-E-16400.

3.3.1 Parts control. The parts to be incorporated in the telephone sets shall be controlled in accordance with MIL-STD-965, Procedure I.

3.4 Design. The telephone set design shall conform to the requirements of Drawings (DWGs) DL 76E2N100, DL 76E3N100, or DL 78E4N100, and MIL-E-16400 to the extent specified herein.

3.4.1 Telephone set composition. Each Type I, Type II, and Type III telephone set shall consist of a handset and a base.

3.4.1.1 Handset. The handset shall be in accordance with DWGs DL 76E2N100, DL 76E3N100, and DL 78E4N100.

3.4.1.2 Base. The base shall contain the necessary components and circuitry required to conform to the performance requirements specified in 3.8. A cradle shall be provided on the front panel of the base for secure stowage of the handset when not in use. The cradle shall contain a hookswitch.

3.4.2 Electrical requirements. The telephone sets shall conform to the electrical requirements specified in 3.4.2.1 through 3.4.2.4.

3.4.2.1 Primary power. The telephone sets shall be designed to operate within the requirements of this specification when the primary power supply line voltage is 24 volts (V) ±10 percent direct current (DC). Current required shall not exceed 250 milliamperes (mA). After power interruption, operation of the telephone sets shall be within specification limits.

3.4.2.2 Electrical bonding. Electrical bonding used in the telephone sets shall conform to the electrical bonding requirements of MIL-E-16400.

3.4.2.3 Internal cabling. Internal cabling used shall conform to the internal cabling requirements of MIL-E-16400.

3.4.2.4 Wire terminations. Wire terminations shall conform to the wire termination requirements of MIL-E-16400.

3.4.3 Controls, indicators, and panel layout.

3.4.3.1 Controls and indicators. Unless otherwise specified (see 6.2.1), the controls and indicators specified in 3.4.3.1.1 through 3.4.3.1.9 shall be provided on the front panels of Type I, Type II, and Type III telephone sets.

3.4.3.1.1 Speaker muted by switch. A three position rotary switch labeled Speaker Muted By shall be provided for controlling the output of the auxiliary circuit (see 3.8.2.10).

3.4.3.1.2 Lamp dimmer control. The lamp dimmer control shall permit the operator to adjust the intensity of the detect, disconnect, cipher, and plain lamps simultaneously.

3.4.3.1.3 Channel select switch, Type II. The channel select switch shall permit the operator to choose a signal interface with any one of a possible 12 external telephone channels.

3.4.3.1.4 Cipher switch. The mode selection of the cipher switch shall be as specified in 3.8.2.6.1 and 3.8.2.8.1.

3.4.3.1.5 Plain switch. The mode selection of the plain switch shall be as specified in 3.8.2.6.1 and 3.8.2.8.1.

3.4.3.1.6 Detect lamp. The detect lamp shall provide the operator a visual indication of the receive cipher condition.

3.4.3.1.7 Disconnect lamp. The disconnect lamp shall provide the operator a visual indication when the telephone set does not have access to the external circuit.

3.4.3.1.8 Cipher lamp. The cipher lamp shall conform to the mode indication specified in 3.8.2.6.2 and 3.8.2.8.2.

3.4.3.1.9 Plain lamp. The plain lamp shall conform to the mode indication specified in 3.8.2.6.2 and 3.8.2.8.2.

3.4.3.2 Panel layout. The base front panel layout shall be as specified in DWG DL 76E2N100 for Type I, DWG DL 76E3N100 for Type II, and DWG DL 78E4N100 for Type III telephone sets.

3.4.4 Mechanical requirements. The base shall use plug-in and hard-wired printed circuit (PC) cards.

3.4.5 Safety. The telephone sets shall be in accordance with the requirements of the Safety criteria paragraph of MIL-E-16400.

3.5 Reliability.

3.5.1 Quantitative reliability requirement. The specified upper test mean-time-between-failures (MTBF) (θ_0 as defined in MIL-STD-781) shall be 10,000 hours. The lower test MTBF (θ_1 as defined in MIL-STD-781) shall be 3333 hours.

3.6 Construction. The telephone sets shall be manufactured in accordance with the drawings and subsidiary specifications listed in DWGs DL 76E2N100, DL 76E3N100, and DL 78E4N100, and related lists, except insofar as errors of omission or commission on the drawings may be incompatible with the requirements of this specification.

3.6.1 Base.

3.6.1.1 Type I and II. The base shall be constructed of ferrous metal and shall have a hinged front panel. The degree of enclosures shall be dripproof (15 degrees) in accordance with MIL-STD-108.

3.6.1.2 Type III. The base and case shall be constructed of nonferrous metal. The degree of enclosure shall be watertight in accordance with MIL-STD-108.

3.6.1.3 Cable entrances. Cable entrances shall be provided on top, bottom, and the right side of the base of a Type I telephone set and on each side of the base of a Type II telephone set. A cable entrance shall be provided on the bottom of the base of a Type III telephone set only. The cradle shall be mounted on the left side of the front panel.

3.6.1.4 Hinged cover. The hinged covers shall conform to the requirement of the Hinged covers paragraph of MIL-E-16400.

3.6.1.5 Fastening devices. The fastening devices shall conform to the requirements of MIL-E-16400.

3.6.2 Handset. The handset shall be in accordance with DWGs DL 76E2N100, DL 76E3N100, and DL 78E4N100.

3.6.3 Welding and soldering. Welding and soldering shall be in accordance with the requirements of MIL-E-16400.

3.6.4 Interchangeability. The telephone sets shall conform to the interchangeability requirements of MIL-E-16400. The drawings listed in DWGs DL 76E2N100, DL 76E3N100, or DL 78E4N100 shall be standard for measuring interchangeability of all assemblies, subassemblies, parts, and materials.

3.7 Maintainability. The telephone sets shall have a mean-corrective-maintenance-time (M_{ct}) not exceeding 20 minutes for repairs accomplished by replacement of lowest subassemblies (modules or printed wiring assemblies) or chassis-mounted parts.

3.8 Performance characteristics.

3.8.1 Channel select switch, Type II. The channel select switch shall be a 12-position single-pole switch and shall conform to the following characteristics:

a. Shall have eight separate, but mechanically coupled, switch decks
b. Resistance. 2 ohms maximum between deck wipers and selected contacts. 100 kilohms (kohms) minimum between deck wipers and all unselected switch contacts
c. Voltage drop (closed contacts). One volt DC maximum
d. Open circuit switch voltage. 28 VDC maximum
e. Closed circuit current. 500 mA DC maximum

3.8.2 Base.

3.8.2.1 Terminal boards, Type I and Type III. The Type I and Type III base shall interface to equipment external to the telephone set through two terminal boards, TB1 and TB2. These interfaces shall conform to the following requirements:

a. TB1:

Terminal number	Function
2 and 3	Transmitter audio output (see 3.8.2.4)
4 and 5	Receive audio input (see 3.8.2.3)
6	Push-to-talk (PTT) (see 3.8.2.5.1)
7	Mode select (see 3.8.2.6.1)

b. TB2:

Terminal number	Function
1 and 2	Audio to speaker ampere (A) (see 3.8.2.10)
3	+24 VDC
4	Hookswitch (see 3.8.2.7)
5	Signal ground (see 3.8.2.11.1)
6	Mode indicate (see 3.8.2.6.2)

3.8.2.2 Terminal boards, Type II. The Type II base shall interface to equipment external to the telephone set through 13 terminal boards, TB1 through TB13. TB1 through TB12 are hereinafter referred to as TB( ). These interfaces shall conform to the following requirements:

a. TB( ):

Terminal number	Function
1 and 2	Transmitter audio output (see 3.8.2.4)
3 and 4	Receive audio input (see 3.8.2.3)
5	PTT (see 3.8.2.5.2)
6	Mode seleect (see 3.8.2.8.1)
7	Hookswitch (see 3.8.2.9)
8	Mode indicate (see 3.8.2.8.2)

b. TB13:

Terminal number	Function
1 and 2	Audio to speaker A (see 3.8.2.10)
3	Signal ground (see 3.8.2.11.1)
4	+24 VDC

c. Only one terminal board in the TB( ) group shall be active at a time, dependent upon the position of the channel select switch.

3.8.2.3 Receive circuit. The receive audio input shall conform to the following characteristics:

a. Maximum input level. 20 decibels referred to one milliwatt (dBm) without permanent damage
b. Operating input level. 0 dBm nominal
c. Operating output level. 100 millivolts (mV) root-mean-square (rms) nominal
d. Input impedance. 600 ohms ±10 percent balanced at 1 kilohertz (kHz)
e. Output impedance. 15 ohms ±2 ohms at 1 kHz unbalanced to ground

f. Frequency gain response. Flat within 3 decibels dB peak-to-peak from 200 hertz (Hz) to 4 kHz
g. Gain. Unity, +0 dB, -4 dB at 1 kHz
h. Distortion. One percent maximum

3.8.2.4 Transmit circuit. Capability for transmitting audio output shall be enabled when the PTT switch is actuated. The transmit circuit shall conform to the following:

a. Input level. -20 dBm average, 0 dBm peak
b. Output level. -6 dBm average, +14 dBm peak. A strap option shall be provided so that the audio output level is -20 dBm average, 0 dBm peak with the strap installed.
c. Input impedance. 470 ohms ±10 percent at 1 kHz unbalanced to ground
d. Output impedance. 600 ohms ±10 percent at 1 kHz balanced
e. Distortion. One percent maximum
f. Frequency gain response. Flat within 1 dB peak-to-peak from 200 Hz to 4 kHz
g. Gain. 14 dB, +1, -2 dB at 1 kHz without strap option; unity +1, -2 dB at 1 kHz with strap option

3.8.2.5 PTT function.

3.8.2.5.1 Type I and Type III. A relay-operated pair of contacts shall be provided which places terminal 6 of TB1 at signal ground when the PTT switch on the handset is closed and the handset is connected to the base and removed from the hook. When the PTT switch is open, terminal 6 of TB1 shall be open. The relay-operated contacts shall conform to the following characteristics:

a. Resistance. 2 ohms maximum (contacts closed)
100 kohms minimum (contacts open)
b. Voltage drop (contacts closed). One V maximum DC, at 500 mA DC

3.8.2.5.2 TYPE II. A relay-operated pair of contacts shall be provided which places terminal 5 of TB( ) at signal ground when the PTT switch on the handset is closed and the handset is connected to the base and removed from the hook. When the PTT switch is open, terminal 5 of TB( ) shall be open. The relay-operated contacts shall conform to the following characteristics:

a. Resistance. 2 ohms maximum (contacts closed)
100 kohms minimum (contacts open)
b. Voltage drop (contacts closed). One V maximum DC, at 500 mA DC

3.8.2.6 Modes of operation, Type I and Type III.

3.8.2.6.1 Mode selection. Selection of CIPHER or PLAIN mode of operation shall be made by means of normally open spring-loaded pushbutton switches. Depressing the CIPHER switch shall place a ground at terminal 7 of TB1. Depressing the PLAIN switch shall place +24 VDC to terminal 7 of TB1. The CIPHER and PLAIN switches shall be of the illuminated type. The interface at terminal 7 of TB1 shall conform to the following characteristics:

a. Resistance. 5 ohms maximum (CIPHER switch closed) between TB1-7 and TB2-5
5 ohms maximum (PLAIN switch closed) between TB1-7 and 1A2 pin G
100 kohms minimum (CIPHER and PLAIN switches open) between TB1-7 and TB2-5, and TB1-7 and TB2-3
b. Voltage drop. One V maximum DC (CIPHER switch closed) between TB1-7 and TB2-5 at 200 mA DC
One V maximum DC (PLAIN switch closed) measured between TB1-7 and 1A2 pin G at a test current of 200 mA DC (test voltage applied between TB1-7 and TB2-3)

3.8.2.6.2 Mode indication. Indication of the mode of operation shall be as follows:

a. CIPHER MODE. When terminal 6 of TB2 is placed at signal ground external to the base, the CIPHER pushbutton switch shall illuminate. Color shall be green. Resistance of the external circuit is 200 ohms maximum.
b. PLAIN MODE. When 24 VDC from an external circuit is applied to terminal 6 of TB2, the PLAIN pushbutton switch shall illuminate. Color shall be red. Resistance of the external circuit is 200 ohms maximum.

3.8.2.7 Hookswitch, Type I and Type III. The hookswitch shall be a double-pole, single-throw (DPST) type and shall function as follows:

a. Provide a switch closure to signal ground at terminal 4 of TB2 when handset is taken off hook, and it shall conform to the following characteristics:
   1. Open circuit (handset ON hook). Resistance at terminal 4, 100 kohms minimum
   2. Closed circuit (handset OFF hook). Resistance at terminal 4, 100 ohms maximum
b. Provide a switch closure which connects +24 VDC to pin E of the base connector when the handset is taken off hook.

3.8.2.8 Modes of operation, Type II.

3.8.2.8.1 Mode selection. Selection of CIPHER or PLAIN mode of operation shall be made by means of normally open spring-loaded pushbutton switches. Depressing the CIPHER switch shall place a ground at terminal 6 of TB( ). Depressing the PLAIN switch shall place +24 VDC to terminal 6 of TB( ). The CIPHER and PLAIN switches shall be of the illuminated type. The interface at terminal 6 of TB( ) shall conform to the following characteristics:

a. Resistance. 5 ohms maximum (CIPHER switch closed) between TB( )-6 and TB13-4
   5 ohms maximum (PLAIN switch closed) between TB( )-6 and 1A2 pin G
   100 kohms minimum (CIPHER and PLAIN switches open) between TB( )-6 and TB13-3, and TB( )-6 and TB13-4
b. Voltage drop. One V maximum DC (CIPHER switch closed) between TB( )-6 and TB13-3 at 200 mA DC mA DC
   One V maximum DC (PLAIN switch closed) measured between TB( )-6 and 1A2 pin G at a test current of 200 mA DC (test voltage applied TB( )-6 and TB13-4)

3.8.2.8.2 Mode indication. Indication of the mode of operation shall be as follows:

a. CIPHER MODE. When terminal 8 of the TB( ) is placed at signal ground external to the base, the CIPHER pushbutton switch lamp shall illuminate. Color shall be green. Resistance of the external circuit is 200 ohms maximum.
b. PLAIN MODE. When 24 VDC from an external circuit is applied to terminal 8 of TB( ) the PLAIN pushbutton switch lamp shall illuminate. Color shall be red. Resistance of the external circuit is 200 ohms maximum.

3.8.2.9 Hookswitch, Type II. The hookswitch shall be a DPST type and shall function as follows:.

a. Provide a switch closure to signal ground at terminal 7 of TB( ) when handset is taken off hook, and it shall conform to the following characteristics:
   1. Open circuit (handset ON hook). Resistance at terminal 7, 100 kohms minimum
   2. Closed circuit (handset OFF hook). Resistance at terminal 7, 100 ohms maximum
b. Provide a switch closure which connects +24 VDC to pin E of the base connector when the handset is taken off hook.

3.8.2.10 Auxiliary audio output. The auxiliary audio output circuit of the telephone sets shall provide a bridging output. A three-position rotary switch labeled Speaker Muted By shall be provided for controlling the output of the auxiliary circuit.

3.8.2.11 Grounds.

3.8.2.11.1 Signal ground. Signal ground shall interface to TB2 terminal 5 on a Type I and Type III telephone set and to TB 13 terminal 3 on a TYPE II telephone set.

3.8.11.2 Chassis ground. Chassis ground shall not be connected to signal ground, however, provision shall be made to internally strap signal ground to chassis ground when desired. When unstrapped, the resistance from signal ground to chassis ground shall be one megohm minimum, 2000 picofarads (pF) maximum, at standard room ambient conditions and 500 kohms minimum during environmental exposure. The isolation shall return to greater than one megohm after 24 hours under standard room ambient conditions.

3.8.2.11.3 Isolated ground. An isolated ground terminal shall be provided in all types of telephone sets. It shall not be connected to either signal or chassis ground.

3.8.2.12 Phantom circuits. The phantom circuits specified in 3.8.2.12.1 and 3.8.2.12.2 shall be supplied.

3.8.2.12.1 Detect. A phantom circuit with respect to signal ground shall be provided to indicate the receive cipher condition. In the application of 6 VDC ±20 percent through 6.8 kohms ±20 percent to the phantom (terminals 2 and 3 of TB1 for Type I and Type II telephone sets and terminals 1 and 2 of TB( ) for Type II telephone set) the DETECT lamp on the front panel shall be illuminated. The color shall be amber. On application of 0 VDC ±0.5 V the DETECT lamp shall not be illuminated.

3.8.2.12.2 Disconnect. A phantom circuit with respect to signal ground shall be provided to indicate connect-disconnect. On the application of a ground of 100 ohms or less to the phantom (terminals 4 and 5 of TB1 for Type I and Type III telephone sets and terminals 3 and 4 of TB( ) for Type II telephone set) the DISCONNECT LAMP shall not illuminate. The blue disconnect lamp shall illuminate with greater than 100 kohms between (TB( )-3 and TB( )-4.

3.8.2.13 Thirteen VDC. When the handset is off hook and PTT switch is depressed, 13 VDC ±10 percent shall be supplied through a series resistance of 470 ohms ±20 percent to terminal A of the receptable which connects to the handset connector. The minimum voltage measured at terminals A and B with the handset connected shall be 4.75 VDC with PTT depressed.

3.8.2.14 Crosstalk. There shall be a minimum of 80 dB isolation over the frequency range of 200 Hz to 4000 Hz between each channel of the 12 telephone transmitter audio output interfaces for Type II telephone set.

3.9 Environmental requirements. The telephone sets shall be constructed so that no fixed part or assembly shall become loose, no moving part or assembly become undesirably free or sluggish in operation, no movable part or control be shifted in setting, position, or adjustment, and no degradation be caused in the performance below that specified herein when subjected to the environmental service conditions of MIL-E-16400 for Range 4 equipment (Type I and Type II) and for Range 2 equipment (Type III).

3.9.1 Temperature. Temperature conditions for Type I and Type II telephone sets shall be in accordance with Range 4 of MIL-E-16400, except the lower limit in the nonoperating temperature condition shall be -55° Celsius (C). Temperature conditions for Type III telephone sets shall be in accordance with Range 2 of MIL-E-16400.

3.9.2 Humidity. The telephone sets shall conform to the humidity requirements of MIL-E-16400.

3.9.3 Salt fog. The cases and panels for Type I and Type II telephone sets shall conform to the requirements of MIL-E-16400 for Range 4 (sheltered) equipment. The TYPE III telephone set shall conform to the requirements of MIL-E-16400 for Range 2 equipment.

3.9.4 Shock. Shock requirements shall be in accordance with the requirements for Grade A, Class I, Type A lightweight equipment as specified in MIL-S-901.

3.9.5 Vibration. The telephone sets shall conform to the vibration requirements of MIL-E-16400.

3.10 Electromagnetic interference (EMI) and electromagnetic compatibility (EMC). The handset and base shall conform to the EMI and EMC requirements in accordance with MIL-STD-461, modified as specified in 3.10.1 and 3.10.2, when operated from a power supply as specified in MIL-C-28843.

3.10.1 Limit requirements for Type I and Type II. The following modifications to the limit requirements of MIL-STD-461, Class A4 and Class A5, below-deck telephones shall apply:

a. Tests CE07, CS02, CS06, and CS09 shall not apply.
b. Test RS02 shall be conducted with the handset cable connected to a base as specified in 3.8.2 and out of the base handset hanger in a user position. The test loop shall be wrapped around the base only for the test.
c. For susceptibility test purposes a 10 mV rms signal induced in the output of the transmit circuit or a -10 dBm signal induced in the earphone in the receive circuit shall be construed as a failure.
d. Test CS01 shall be performed at 10 mV at the frequencies of 60 Hz and 120 Hz only.

3.10.2 Limit requirements for Type III. The following modifications to the limit requirements of MIL-STD-461, Class A4 and Class A5 telephone equipment shall apply:

a. Tests CE07, CS02, CS06, and CS09 shall not apply.
b. Test CS01 shall be performed at 10 mV at the frequencies of 60 Hz and 120 Hz only.
c. Test RS02 shall be conducted with the handset cable connected to a Type III base as specified in 3.8.2 and out of the base handset hanger in a user position. The test loop shall be wrapped around the base for the test.
d. For susceptibility test purposes, a 10 mV rms signal induced in the output of the transmit circuit or a -10 dBm signal induced in the earphone in the receive circuit shall be construed as a failure.
e. Test RS03 shall be performed at above-deck limit levels.

3.11 Physical requirements.

3.11.1 Type I. The Type I telephone set base shall be capable of being bulkhead-mounted. The dimensions shall not exceed 254 millimeters (mm) (10 inches (in)) high, 152.4 mm (6 in) wide, and 76.2 mm (3 in) deep, excluding handset, controls, hardware, and cover plates mounted on the base. Overall depth with handset mounted in the cradle shall not exceed 165.1 mm (6.5 in). Total weight shall not exceed 3.175 kilograms (kg) (7 pounds (lbs)).

3.11.2 Type II. The Type II telephone set base shall be capable of being bulkhead-mounted. The dimensions shall not exceed 254 mm (10 in) high, 177.8 mm (7 in) wide, and 127 mm (5 in) deep, excluding handset, controls, hardware, and cover plates mounted on the base. Overall depth with handset mounted in the cradle shall not exceed 228.6 mm (9 in). Total weight shall not exceed 5.45 kg (12 lbs).

3.11.3 Type III. The Type III telephone set base shall be capable of being bulkhead-mounted. The dimensions shall not exceed 369 mm (14.5 in) high, 216 mm (8.5 in) wide, and 204 mm (8 in) deep with cover closed. Total weight shall not exceed 9 kg (20 lbs).

3.12 Color and finish. Color and finish shall be in accordance with the requirements of DWG DL 76E2N100 for Type I, DWG DL 76E3N100 for Type II, and DWG DL 78E4N100 for Type III telephone sets.

3.13 Workmanship.

3.13.1 General workmanship. The workmanship and soldering shall conform to the Workmanship and Soldering paragraphs of MIL-E-16400.

3.13.2 Workmanship screen. All telephone sets produced in accordance with this specification shall withstand a defect detection vibration screen of random type vibration at $0.04g^2/Hz$ ±3 dB from 80 Hz to 350 Hz and temperature cycling as specified in 4.5.6.2.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Government verification. All quality assurance operations performed by the contractor will be subject to Government verification at any time. Verification will consist of, but is not limited to, a) Surveillance of the operations to determine that practices, methods, and procedures of the written quality program are being properly applied, b) Government product inspection to measure quality of the product to be offered for acceptance, c) Government inspection of delivered products to assure compliance with all inspection requirements of this specification. Failure of the contractor to promptly correct deficiencies discovered by him or of which he is notified shall be cause for suspension of acceptance until corrective action has been taken or until conformance of the product to prescribed criteria has been demonstrated.

4.1.2 Quality assurance terms and definition. Quality assurance terms used in this specification shall be as defined in MIL-STD-109.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.3)
b. Quality conformance inspection:
    1. Production inspection (see 4.4.1)
    2. Production control inspection (see 4.4.2)
    3. Environmental inspection (see 4.4.3)
c. Reliability testing (see 4.6)
d. Maintainability demonstration (see 4.9)
e. Inspection of preparation for delivery (see 4.11)

4.3 First article inspection. Unless otherwise specified (see 6.2.1), one unit shall be required for first article inspection. First article inspection shall consist of all examination and testing necessary to determine compliance with the requirements of this specification. First article inspection shall include the tests specified in TABLE I.

4.4 Quality conformance inspection.

4.4.1 Production inspection (Group A). Production inspection shall be made on every telephone set offered for delivery. The inspection shall comprise such examination and testing which will prove the workmanship and reveal the omissions and errors of the production process, such as functional and performance tests at a limited number of points, tests which detect deviations from design, tests of adjustment, and tests which detect hidden defects of material. Production inspection shall include the examinations and tests shown in Group A of TABLE I.

4.4.2 Production control inspection (Group B). Production control inspection shall be conducted on a sampling basis in conformance with the inspection procedures of MIL-STD-105 to an acceptable quality level (AQL) of 6.5 percent, using the special inspection level S-3 for normal, tightened, and reduced inspection. Production control inspection shall be performed on telephone sets that have been subjected to and have passed production inspection. Production control inspection shall consist of the examination and functional and performance tests throughout the entire range of operation; detect any deterioration of the design by wear of dies, molds, and jigs, by variations in parts; deviations in the processing temperature rise in operation and

ability of telephone sets to withstand this heat; tests of efficiency; and tests of the telephone set performance. These tests shall be performed on the complete telephone set as offered for delivery. Production control inspection shall include the examinations and tests shown in Group B of TABLE I.

TABLE I. Examinations and test.

Examination or test	Requirement paragraph	Test paragraph	First article inspection	Quality conformance inspection		
				Group A	Group B	Group C
Surface examination	3.4, 3.6	4.5.1				
Weight	3.11	4.5.1	X		X	
Size	3.11	4.5.1	X	X		
Parts and materials	3.3	4.5.1	X	X		
Finish	3.12	4.5.1	X	X		
Marking	3.12					
Safety	3.4.5	4.5.1	X	X		
Workmanship	3.13.1	4.5.1	X	X		
Workmanship screen	3.13.2	4.6	X	X		
Pre-performance		4.5.1	X		X	X
Performance:	3.8	4.5.2	X	X		
Base:						
Terminal board: interfaces	3.8.2.1, 3.8.2.2	4.5.2	X	X		
Audio performance:						
Transmit circuit	3.8.2.4	4.5.2	X	X		
Receive circuit	3.8.2.3	4.5.2	X	X		
Auxiliary output	3.8.2.5	4.5.2	X	X		
PTT function	3.8.2.5	4.5.2	X	X		
Modes of operation:						
Mode selection	3.8.2.6.1, 3.8.2.8.1	4.5.2	X	X		
Mode indication	3.8.2.6.2, 3.8.2.8.2	4.5.2	X	X		
Hookswitch function	3.8.2.7, 3.8.2.9	4.5.2	X	X		
Grounding provisions	3.8.2.11	4.5.2	X	X		
Phantom circuits:	3.8.2.12	4.5.2	X	X		
13 VDC	3.8.2.13	4.5.2	X	X		
Crosstalk	3.8.2.14	4.7	X		X	
Temperature:						
Low temperature	3.9.1	4.5.3	X			X
High temperature	3.9.1	4.5.3	X		X	X
Humidity	3.9.2	4.8	X			X
Shock	3.9.4	4.8.3	X			
Vibration	3.9.5	4.5.1	X			X
Salt fog	3.9.3	4.5.5	X			
Enclosure	3.6.1.1, 3.6.1.2	4.5.1	X			
Weld	3.6.3	4.5.1	X			
Voltage limits	3.4.2	4.5.1	X		X	
Power interruption	3.4.2	4.5.1	X		X	
Electromagnetic interference	3.10	4.5.4	X			

4.4.3 Environmental inspection (Group C). Environmental inspection shall encompass tests of telephone set durability; simulated service tests; test of the effects of environment (such as extremes of temperature and humidity, effect of salt air); effects of shock, vibration, and inclination. Environmental inspection shall include the examinations and tests shown in Group C of TABLE I. Environmental inspection shall be performed on a sampling basis on telephone sets which have been subjected to and have passed production inspection (see 4.4.3.1).

4.4.3.1 Environmental inspection samples. Samples for the environmental inspection shall be selected, without regard to their quality, in accordance with the following:

a. One sample from the first 25 production units fabricated
b. One sample from each successive 100 units, or fraction thereof, produced

4.5 Test methods.

4.5.1 Examinations and tests. Examinations and tests shall be conducted in accordance with the applicable test methods of MIL-E-16400, except as specified in 4.5.2 through 4.5.9.

4.5.2 Performance test. The telephone sets shall be energerized and subjected to a performance test to ensure proper functioning and operation at an adequate number of points in the required range to demonstrate conformance to specification requirements, including safety. The performance test shall include, but not be limited to, the tests shown in TABLE I.

4.5.3 Temperature tests. Temperature tests shall be conducted to determine conformance with the requirements specified in 3.9.1.

4.5.4 EMI and EMC susceptibility test. The EMI and EMC tests shall be performed in accordance with MIL-STD-462 on the different types of telephone sets to the limits specified in 3.10.

4.5.5 Salt fog.

4.5.5.1 Type I and Type II. The telephone set case and cover shall satisfactorily resist the destructive action of the salt fog test of MIL-E-16400 for Range 4 (sheltered) equipment.

4.5.5.2 Type III. The telephone set shall satisfactorily resist the destructive action of the salt fog test of MIL-E-16400 for Range 2 (exposed) equipment. This test shall be performed with the outer cover opened exposing the front panel. When tested with the outer cover opened, the telephone set shall be in full operation. Any interruption requiring a maintenance procedure for full operation of the telephone set during the salt fog test is a criteria for failure.

4.6 Workmanship screen.

4.6.1 Vibration screen. Prior to conducting temperature cycling, vibration shall be performed on each telephone set. The vibration may be performed at the module, drawer, or end item level. All the hardware, including cables and connectors, shall be exposed to vibration. The vibration shall be random, or subject to procuring activity approval, pseudo-random or complex waveform vibration, for an accumulated time of 10 minutes in the axis deemed most susceptible to vibration excitation. All telephone sets shall be hard-mounted (without shock isolators) and subjected to the vibration conditions of FIGURE 1. The control accelerometer shall be located next to one of the mounting points of the set under vibration. Telephone sets having a bandwidth no greater than 10 Hz for vibration frequencies up to 500 Hz and 100 Hz for vibration frequencies above 500 Hz shall be used for the control and analysis of the acceleration spectral density (ASD). The telephone set shall be energized during vibration and appropriate input signals applied to observe any abnormal conditions of the output functional characteristics. All failures occurring during screening shall be corrected and the vibration resumed.

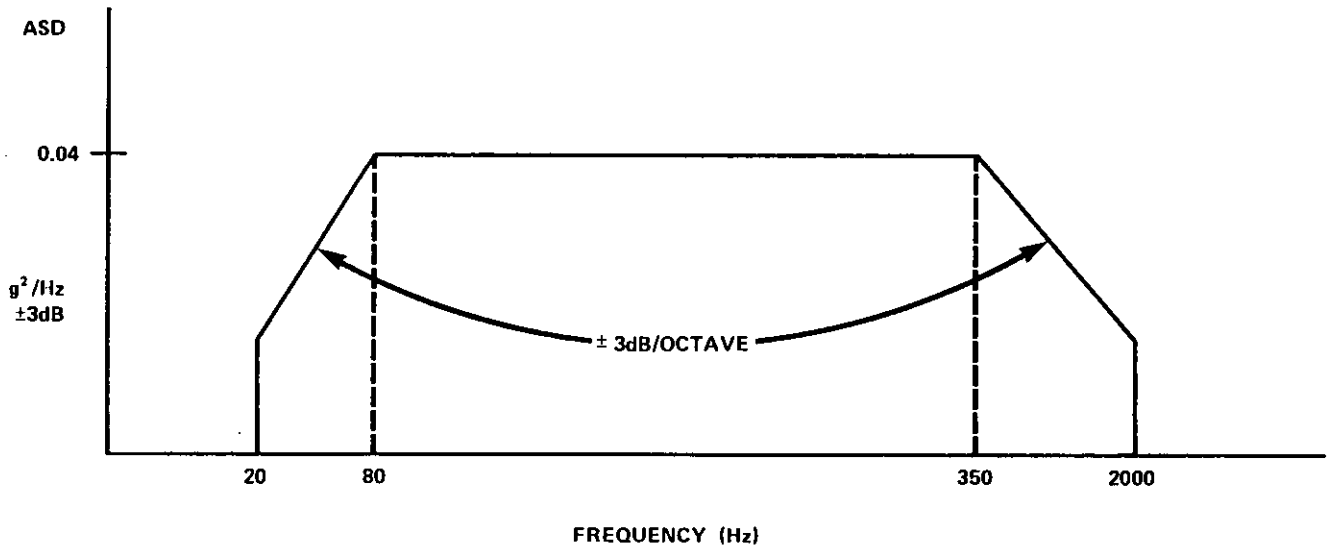

FIGURE 1. Random vibration curve.

4.6.2 Temperature cycling. Each telephone set shall be subjected to 10 cycles of the temperature curve shown in FIGURE 2. The temperature rate of change shall not be less than 5°C per minute. Telephone set power shall be turned on and off at the indicated times. When practical, the telephone set drawers, panels and enclosures shall be opened or removed for maximum exposure to the changing temperature. When performance measurements are called for, a functional operating test shall be performed. The dwell time shall be 80 percent of the time required for the largest electrical or electronic part to become temperature stabilized. Temperature stabilization shall be as defined in MIL-STD-810 for the nonoperating condition. When failures occur, the telephone sets shall be reworked and the cycling continued for a cumulative total of 10 cycles.

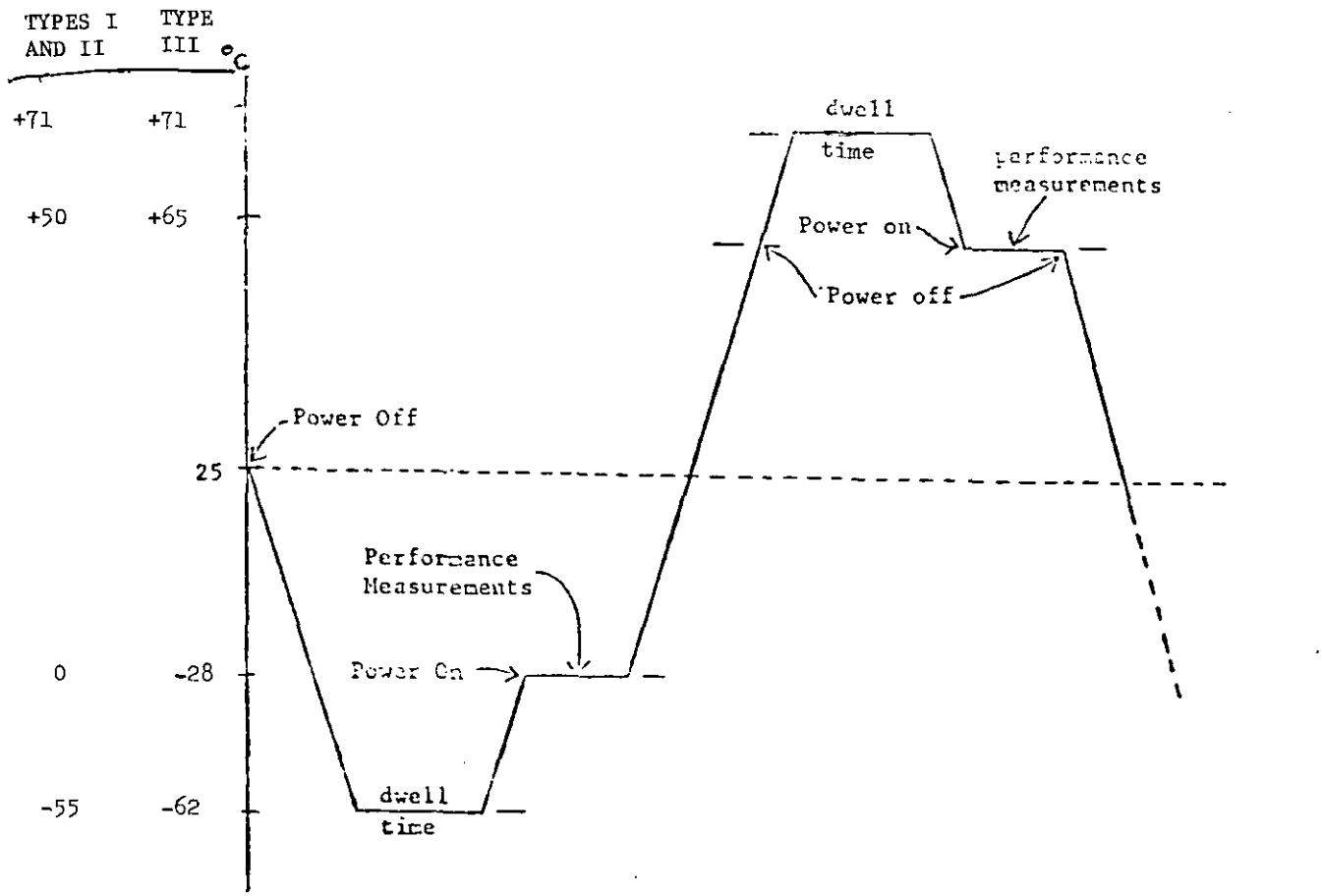

FIGURE 2. Temperature curve (one cycle).

4.7 Crosstalk test, Type II. Crosstalk testing shall be performed on the Type II telephone set base. All transmitter audio output circuits shall be terminated for this test at terminal boards TB1 through TB12, terminals 1 and 2 with 600 ohms ±10 percent. The PTT (see 3.8.2.5.2) and hookswitch (see 3.8.2.9) circuits shall be activated for the test. A power source of +24 VDC shall be applied at terminal board TB13, terminal 4 (+24 VDC) and terminal 3 (24 VDC return) for the test. The receive audio input on TB( ), terminal 3 and 4 shall be driven with a 0 dBm signal over the frequency range specified in 3.8.2.14. The channel select switch shall be placed on the same numbered channel as the driven channel for the test. All transmitter audio outputs, except the channel being driven, shall be individually monitored for crosstalk at TB( ), terminals 1 and 2.

4.8 Humidity test.

4.8.1 Type I and Type II. The humidity test for Type I and Type II telephone sets shall be in accordance with MIL-E-16400.

4.8.2 Type III. The humidity test for Type III telephone sets shall be in accordance with MIL-E-16400 with outer door opened.

4.8.3 Shock test. The shock test shall be in accordance with MIL-E-16400. The handset may be separately secured to the test plate to preclude damage resulting from its detachment from the telephone handset hanger (cradle) for Type I and Type II telephone sets. For Type III telephone set the handset shall remain in the cradle during test with the outside cover in place.

4.9 Reliability test. Production reliability acceptance testing shall be performed in accordance with Test Plan VC of MIL-STD-781 on a sample of at least 20 units selected from the first month's production. The reliability test shall be successfully completed prior to delivery of any production telephone sets under the contract. In the event Type I, Type II, and Type III telephone sets are ordered in a single contract, the test sample shall contain an equal number of each.

4.9.1 Reliability test environment. Environmental conditions during the reliability test shall be as follows:

a. The ambient temperature shall be cycled between 0°C (+2°C, -0°C) for 3 hours and 50°C (+0°C, -2°C) for 3 hours.
b. The telephone sets shall be vibrated at 0.508 mm (0.020 in) (double amplitude (DA)) ±0.012 mm (±0.004 in) DA with a frequency of 4 Hz to 33 Hz to 4 Hz measured at the mounting points of the telephone sets. The sweep time shall be 10 minutes ±2 minutes (up and down). The vibration shall be applied continuously for 1 hour every 3 hours.
c. Input power shall be changed daily in the following sequence:
   1. Nominal. +24 VDC
   2. Nominal. +5 percent
   3. Nominal. -5 percent

4.9.2 Operating duty cycle. All circuit elements shall be activated throughout the reliability test. Audio input signals and output impedance loads shall be used to simulate interfering equipments.

4.9.3 Failure. The procuring activity shall be notified within 48 hours of any failure during reliability testing. Failures will be classifed by the procuring activity in accordance with MIL-STD-781.

4.9.4 Rejected telephone sets. In the event of a reject decision in reliability testing, the contractor shall determine the cause(s) of rejection and propose a plan for correction of deficiencies. After all proposed corrective actions have been approved by the procuring activity and incorporated into the test samples, the reliability test shall be reperformed as specified herein.

4.9.5 Disposition of tested telephone sets. Upon successful completion of reliability testing, the tested telephone set shall be returned to the production area for reinspection and reconditioning as required and shall be subjected to the production tests of 4.4.1 to assure that it conforms to the requirements of this specification. After reconditioning, reinspection, and retesting, the telephone set may be delivered as part of the contract quantity provided it conforms to all terms and conditions of the contract for acceptance.

4.10 Maintainability demonstration. Conformance with the specified maintainability requirement shall be demonstrated in accordance with Method 4 of MIL-STD-471. Only Phase II of MIL-STD-471 shall apply. The term equipment-repair-time (ERT) used in MIL-STD-471 corresponds to M_{ct}. The demonstration shall consist of 20 corrective maintenance tasks requiring replacement of a subassembly or chassis-mounted part.

4.10.1 Selection of corrective maintenance tasks. For the maintainability demonstration, 30 candidate faults shall be determined in accordance with Appendix A of MIL-STD-471. The following information shall be made available for each candidate task:

a. Designation of specific faulty part
b. Failure mode
c. Means of introducing fault (substitution of faulty part or simulation thereof)

The procuring activity or its authorized representative shall use the candidate tasks as a guide to select a sample of 20 faults for the demonstration.

4.10.2 Technical documentation. Technical documentation to be used for the demonstration shall be limited to the technical manual.

4.10.3 Accept or reject criteria. Accept or reject criteria shall be in accordance with Method 4 of MIL-STD-471. If a reject decision is reached, the procuring activity shall be immediately notified. The contractor shall at no additional cost to the Government:

a. Develop an approach for redesign or correction of all deficiencies, and
b. Upon approval of an approach to the redesign or corrections, the contractor shall implement the approach and repeat the demonstration until an accept decision is reached.

4.11 Inspection of preparation for delivery. Inspections shall be conducted to ensure comformance to the requirements of Section 5.

5. PACKAGING

(The preparation for delivery requirements specified herein apply only for direct Government procurements. Preparation for delivery requirements of referenced documents listed in Section 2 do not apply unless specifically stated in the contract. Preparation for delivery requirements for products procured by contractors shall be specified in the individual order.)

5.1 Preservation, packaging, packing, and marking. Unless otherwise specified herein, preparation for delivery shall be in accordance with the applicable levels of preservation, packaging, and packing, and marking specified in MIL-E-17555 (see 6.2.1).

6. NOTES

6.1 Intended use. The telephone set covered by this specification is intended for use in a voice communications system on all ship types. It will provide an operator the capability to transmit either in a secure mode (CIPHER) or in a PLAIN mode when connected to a radio channel. Reception will be in either the CIPHER or PLAIN mode, automatically selected by associated external equipment.

6.2 Ordering data.

6.2.1 Procurement requirements. Procurement documents should specify the following:

a. Title, number, and date of this specification
b. Type required (see 1.2)
c. Control and indicators if other than as specified in 3.4.3.1
d. Number of first article samples to be submitted if other than as specified in 4.3
e. Levels of preservation, packaging, packing, and marking (see 5.1)

6.2.2 Data requirements. When this specification is used in a procurement which incorporates a DD Form 1423 and invokes the provisions of 7-104.9(n) of the Defense Acquisition Regulation (DAR), the data requirements identified herein will be developed as specified by an approved Data Item Description (DID) (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL) (DD Form 1423) incorporated into the contract. When the provisions of DAR 7-104.9(n) are not invoked, the data specified herein will be delivered by the contractor in accordance with the contract requirements. Deliverable data required by this specification are cited in the following paragraphs:

Paragraph	Data requirement	Applicable DID
3.3	Program Parts Selection List (PPSL)	DI-E-7027
3.3	Nonstandard Part Approval/Requests Proposed Additions To An Approved PPSL	DI-E-7028
4.3	First Article Inspection Report	DI-T-4902

(Copies of DIDs required by the contractor in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

6.3 First article. When a first article is required it shall be tested and approved under the appropriate provisions of 7-104.55 of the DAR. The first article should be a first production item. The first article should consist of one unit. The contracting officer should include specific instructions in all procurement instruments, regarding arrangements for examinations, tests, and approval of the first article.

6.4 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

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

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY DOCUMENT REQUIREMENT CONSIDERED TOO RIGID

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☐ YES ☐ NO *(If "Yes", in what way?)*

4. REMARKS

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