

MIL-C-22873A(EC)
17 September 1968
SUPERSEDING
MIL-C-22873(SHIPS)
17 April 1961
MIL-C-22873(SHIPS)
NOTICE - 1 ¹/₇
16 April 1968

MILITARY SPECIFICATION
CONVERTER-SHIFT REGISTER GROUP
AN/UGA-3()

1. SCOPE

1.1 This specification covers requirements for a group of terminal units that will accept tone signals, keyed in International Morse Code, and translate the signals into International Telegraph Alphabet #2, American Version.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS
MILITARY

- | | |
|-------------|--|
| MIL-Q-9858 | - Quality Program Requirements. |
| MIL-M-15071 | - Manuals, Equipment and Systems. |
| MIL-E-16400 | - Electronic Equipment, Naval Ship and Shore;
General Specification. |
| MIL-E-17555 | - Electronic and Electrical Equipment and Associated
Repair Parts, Preparation for Delivery of. |
| MIL-D-23140 | - Drawings, Preliminary and Final, Electronic
Equipment and Systems, Installation Control. |

¹/₇ REINSTATEMENT - Revision A reinstates this specification and supersedes MIL-C-22873(SHIPS), 17 April 1961 and Notice 1, 16 April 1968.

FSC 5815

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STANDARDS MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-108 - Definitions of and Basic Requirements for Enclosures for Electric and Electronic Equipment.
- MIL-STD-189 - Racks, Electrical Equipment 19-inch and Associated Panels.
- MIL-STD-454 - Standard General Requirements for Electronic Equipment.
- MIL-STD-461 - Electromagnetic Interference Characteristics, Requirements for Equipment.
- MIL-STD-749 - Preparation and Submission of Data for Approval of Nonstandard Electronic Parts.
- MIL-STD-756 - Reliability Prediction.
- MIL-STD-781 - Reliability Tests: Exponential Distribution.
- MIL-STD-785 - Requirements for Reliability Program (For Systems and Equipment).

PUBLICATIONS MILITARY

- MIL-HDBK-217 - Reliability Stress and Failure Rate Data for Electronic Equipment.

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

3. REQUIREMENTS

3.1 Design objectives. The equipment shall be such as to attain the Design objectives of MIL-E-16400.

3.2 Reliability and maintainability.

3.2.1 Reliability

3.2.1.1 Quantitative reliability requirements. The equipment shall be designed for a specified mean-time-between-failure (MTBF), (θ_0), of 2500 hours.

3.2.1.2 Reliability program plan. The contractor shall prepare for approval, a reliability program plan in accordance with the requirements of this specification and the requirements of MIL-STD-785. The reliability program plan shall describe the tasks to be performed and the procedures for conducting and controlling the reliability program. The reliability program plan shall describe the applicability or non-applicability of each paragraph of MIL-STD-785. A detailed reliability program plan shall be submitted to the procuring activity, twenty (20) days after contract award, for approval, with an information copy to NAVELEX Code 047.

3.2.1.3 Reliability prediction. A design reliability prediction shall be performed in accordance with the procedures described in MIL-HDBK-217 based on stress factors and part populations. The prediction shall be based on the operational requirements of this specification for a shipboard environment. The source and applicability of all failure data used for the reliability prediction shall be documented in a reliability prediction report. A report shall be submitted one hundred and twenty (120) days after contract award to the procuring activity, with an information copy to NAVELEX Code 047, on the procedures, results and conclusions of the reliability prediction.

3.2.1.4 Reliability testing. Reliability testing shall be performed in accordance with 4.6.

3.2.1.5 Reliability reports. The contractor shall prepare a report on the procedures, results, and conclusions for the reliability activities of 3.2.1 and the reliability program plan. Reports shall be submitted within ten days after work completion of each reliability activity to the procuring activity with an information copy to NAVELEX Code 047.

3.2.2 Maintainability. The AN/UGA-3() shall be constructed to provide ease of accessibility for replacements of all parts.

3.3 Design requirements.

3.3.1 General design. The Converter-Shift Register Group shall consist of two major units; a comparator-filter assembly to convert Morse keyed tone signals into neutral dc telegraph signals, a converter-shift register that will accept neutral dc Morse and translate into International Telegraph Alphabet #2.

3.3.1.1 The converter unit shall be capable of operation independently of the comparator-filter assembly.

3.3.2 Material and parts. The material and parts used in the construction of this equipment shall be selected in accordance with MIL-E-16400. Semiconductor elements shall conform to MIL-STD-454. Approval to use non-standard parts shall be processed in accordance with MIL-STD-749. Items or processes which require approval of the procuring activity are listed in MIL-E-16400.

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3.3.3 Environmental conditions. The equipment shall meet the requirements of MIL-E-16400 for temperature (Class 4 of Table II), and humidity.

3.4 Electrical requirements.

3.4.1 Primary power. Primary power shall be single phase 120 volts ac ± 10 percent at 50 or 60 Hz ± 5 percent.

3.4.2 Fuses and blown fuse indicators. Fuses and blown fuse indicators shall be provided, located on the front panel.

3.4.3 Tests points and test features. Test points and test features shall be provided in accordance with MIL-E-16400.

3.4.4 Printed wiring. Printed wiring, in accordance with MIL-E-16400, shall be used as extensively as possible, in the form of plug-in circuit boards. Modular construction shall be used throughout the equipment.

3.4.5 Radio interference and undesired radiation. Radio interference and undesired radiation shall be within the requirements of MIL-STD-461 for class 1C equipment.

3.5 Mechanical requirements.

3.5.1 The two units comprising the Converter Group shall be housed in two separate enclosures, suitable for mounting in a standard 19-inch relay rack conforming to MIL-STD-189, or bulkhead mounting without a separate rack.

3.5.1.1 Degree of enclosure. Degree of enclosure shall be as defined for open, protected, in MIL-STD-108.

3.5.2 External finish. External finish shall be in accordance with MIL-STD-16400, for coating and treatments.

3.5.3 Size and Weight. The equipment shall be designed to meet size limitations of MIL-E-16400 for submarine installation. Height shall be a standard multiple of 1-3/4 inches, not to exceed 17.5 inches. Depth shall not exceed 23 inches, measured from the back side of the front panel, not including connectors. Weight shall be the minimum necessary to achieve the specified performance, reliability and maintainability.

3.5.4 Shock, vibration and inclination. The equipment shall meet the shock, vibration and inclination requirements of MIL-E-16400. Resilient shock mounts, shall be provided as part of the equipment if required.

3.5.4.1 Accessibility. The equipment shall be designed so that all installation, maintenance and operating procedures may be performed from the front of the cabinet, and the cabinet may be mounted with its rear surface and side surfaces against bulkheads or other equipment.

3.5.5 Comparator-Filter functional requirements.

3.5.5.1 The comparator-filter unit shall accept as input the Morse keyed tone output of a radio receiver, at 1000 Hz \pm 15Hz. Input speeds shall be 10 to 110 words per minute (wpm).

3.5.5.2 Input impedance. Input impedance shall be nominal 6000 ohms, ungrounded.

3.5.5.3 Acceptable input level shall be 0 dBm, \pm dB.

3.5.5.4 The equipment shall function properly with an input signal having a 10 dB signal to noise ratio. Suitable filters shall be incorporated for reducing the effect of noise and spurious signals.

3.5.5.5 A suitable oscilloscope shall be incorporated for visual indication of the centering of the incoming audio frequency.

3.5.5.6 The comparator-filter shall provide two outputs for simultaneous use: a 1000 Hz regenerated audio signal suitable for headphone monitoring, and a neutral loop circuit for keying the associated Morse/teletype converter-shift register.

3.5.6 Control motor assembly. A control motor assembly shall be provided, for mechanical connection to the associated receiver. Its function is to keep the frequency of the receiver tone output within the operating tolerance of the comparator-filter assembly.

3.5.6.1 The control motor assembly shall be designed to be mounted on an AN/SRR-11, AN/BRR-3 or similar type receiver. It shall provide a minimum of 4 inch-ounces of stalled torque.

3.5.7 Terminals shall be provided for monitoring the receiver output.

3.6 Converter-Shift Register functional requirements.

3.6.1 The Converter shall accept Morse signals as derived from the output of the comparator-filter. Alternately, the Converter shall accept on-off keying from an external Morse keyed circuit.

3.6.2 International Morse code at speeds of 10 to 100 wpm shall be translated to CCITT Alphabet #2, American version, with output speeds of at least 45.5, 50, 56.9 and 75 bauds, and standard 7-unit start-stop code.

3.6.3 The output shall be capable of keying a standard 60 mA, 130 V neutral loop. Loop current will be supplied by station battery.

3.6.4 Provision shall be made for reversing the signal sense.

3.6.5 Total distortion of the output signals shall be less than 5 percent.

3.6.6 Converter logic shall provide for translation of all 26 letters of the English alphabet and 10 numerical digits. The following punctuation marks shall appear as upper-case teleprinter symbols:

MORSE	UPPER CASE TELETYPE
dash -....-	A
interrogation ..-.-.	B
colon ---..	C
\$...-..	D
parentheses -.-.-.	K
period .-.-.-	M
comma ---..	N
apostrophe .-....	J
semicolon -.-.-.	V
fraction -...-	X
quotation mark .-....	Z

3.6.6.1 In addition, the logic shall recognize the Morse characters \overline{AR} .-.-. and \overline{BT} -...- \overline{BT} and \overline{AR} shall be translated to carriage return, line feed, line feed.

3.6.6.2 Morse II (... ..) shall be translated as a teleprinter space character, when preceded by a word space and followed by a word space.

3.6.6.3 Provision shall be made for automatic insertion, upon receipt of the first teleprinter space (SP) character following the 64th teleprinter character after a previous carriage return (CR), line feed (LF), of an internally generated CR, LF combination. The same combination shall be inserted in any case when 72 characters have been received since last CR, LF.

3.7 The converter logic shall automatically compute and adjust for input speeds of 10 to 35 wpm. For speeds above 35 wpm, front panel adjustment may be provided.

3.7.1 Operating at a rate within an anticipated range of speed, the logic shall compensate for instantaneous variation in input rate within 25 percent the average rate.

3.7.2 Test facilities. A built-in one-character generator shall be supplied to provide a simulated signal for making tests and adjustments. Fifty characters are required to check the register and matrix. The special function section requires upper and lower-case characters and the characters, AR, BT and the double character II. This one-character generator shall be the means of testing all parts of the circuitry associated with the characters without the need for an external signal.

3.8 Supplementary requirements of MIL-E-16400 shall be met, except that instruction plates are not required.

3.9 Drawings and manuals. When required by contract or order, instruction manuals shall be Type II in accordance with MIL-M-15071, and installation drawings shall be in accordance with MIL-D-23140.

3.10 Workmanship. Workmanship shall be in accordance with MIL-STD-454.

4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Contractor's quality assurance system. The contractor shall provide and maintain an effective inspection and quality control system acceptable to the Government covering the supplies under the contract. The quality control system shall be in accordance with specification of MIL-Q-9958. A current written description of the system shall be submitted to the Naval Electronic Systems Command, Washington, D.C. 20360 via the cognizant Government inspector, for system approval, sixty (60) days prior to preproduction inspection. If preproduction inspection is not required, the written description of the quality control system shall be submitted for approval sixty (60) days prior to production inspection. An advance copy shall be forwarded to the Naval Electronic Systems Command, Attention: NAVELX Code 047. The written description shall include flow charts showing the complete flow of material from inspection on receipt, through all manufacturing processes, to final shipment. The various processes and inspection positions shall be clearly identified on the flow charts and cross referenced to the detailed inspection procedures and criteria of the written description of the quality control system. Any changes to the approved

quality control system which might affect the degree of assurance required by this specification or other applicable documents shall be submitted to the Naval Electronic Systems Command for approval prior to use.

4.1.2 Government verification. All quality assurance operations performed by the contractor will be subject to Government verification at any time. Verification will consist of (a) surveillance of the operations to determine that practices, methods, and procedures of the written system description are being properly applied, and (b) Government product inspection to measure quality of product to be offered for acceptance. 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 made or until conformance of product to prescribed criteria has been demonstrated.

4.1.3 Tests, Test equipment and test procedures. The contractor shall submit a list of proposed tests and written test procedures including test equipment and tolerance limits to be used in testing preproduction or first article and production equipment to NAVELEX, via the Government inspector, for review and approval, sixty (60) days prior to beginning preproduction or first article tests. An advance copy shall be forwarded to NAVELEX Code 05112 and NAVELEX Code 047. Each test shall be identified in accordance with 4.2 as to classification. The contractor may, at his option, submit the production portion sixty (60) days prior to beginning production.

4.2 Classification of inspection. The method of examination and testing of the equipment fall within the following classifications:

- (a) Preproduction inspection
- (b) Quality conformance inspection
 - (1) Production inspection
 - (2) Production control inspection
 - (3) Environmental tests
- (c) Reliability testing

4.3 Preproduction inspection. Preproduction inspection shall consist of all examination and testing necessary to determine compliance with requirements specified herein. Preproduction inspection shall consist of the tests specified in MIL-E-16400 and approved in accordance with 4.1.3 herein except that the following will not be required:

- (a) Water cooling
- (b) Enclosure test
- (c) Noise
- (d) Salt spray test
- (e) The Accelerated life test (see 4.6.1)

4.3.1 Preproduction inspection report. Six (6) copies of the preproduction inspection report shall be submitted within thirty (30) days of completion of the preproduction inspection to the Naval Electronic Systems Command, Washington, D.C., 20360, via the Government inspector, for review and approval. An advance copy shall be forwarded to NAVELEX Code 05112. The preproduction inspection report shall indicate specification compliance limits as well as actual performance test results. The contractor shall certify that, on the basis of the report, the equipment does or does not comply with specification requirements.

4.4 Quality conformance inspection.

4.4.1 Production inspection. Production inspection shall be made on every equipment offered for delivery. The inspection shall comprise such examination and testing as 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 hidden defects of material. Production inspection shall consist of the tests approved in accordance with 4.1.3 and shall include the following:

<u>Inspection</u>	<u>Reference Paragraph</u>
(a) Surface examination	4.5.1
(b) Operating test	4.5.2

4.4.2 Production control inspection. Production control inspection, including sampling, shall conform to table I and to the procedures for special inspection levels of MIL-STD-105. The inspection level shall be S-4 for normal, tightened, and reduced inspection. Production control inspection shall be performed on equipments that have passed production inspection. The equipment shall satisfactorily meet the requirements of Production control inspection prior to release for shipment.

Table I - Production control inspection.

<u>Inspection</u>	<u>Reference</u>	<u>AQL%</u>
(a) Supply line voltage	3.4.1	6.5
(b) Heat test	MIL-E-16400	6.5
(c) Power	MIL-E-16400	6.5
(d) Controls & Control Circuits	MIL-E-16400	6.5

4.4.2.1 Rejected lots. If an inspection lot is rejected, the supplier may withdraw the lot from further inspection. The supplier may also rework a rejected lot to correct the defective units and reinspect the lot using tightened inspection. Rejected lots shall be kept separate from new lots and shall not lose their identity.

4.4.2.2 Non conformance and retest. If a sample unit fails a test specified in 4.4.2, the contractor shall immediately investigate the cause of failure and shall report to the Government inspector the results thereof and details of the corrective action taken to correct units of product which were manufactured with the same conditions, materials or processes. The equipment shall then be retested.

4.4.2.3 Corrective action. If corrective action results in a change of part(s), circuit layout or the mechanical arrangement, or if the government inspector does not consider that the corrective action will enable the product to meet specified requirements, or if the contractor cannot determine the cause of failure, the matter shall be referred immediately to the contracting officer. It shall then be determined by the command or agency concerned whether correction should be made to the equipments already delivered under the contract.

4.4.2.4 Reinspection of conforming production control test units. Unless otherwise specified, sample units which have been subjected to and passed production control inspections may be accepted on the contract provided they are resubjected to and pass production inspection after repair of all visible damage.

4.4.3 Environmental inspection. Environmental inspection shall be performed as part of the preproduction inspection in accordance with 4.3 on equipment or equipments that have passed production inspection as specified in 4.4.1.

4.5 Inspection procedures.

4.5.1 Surface examination. Equipment shall be examined for workmanship, assembly and fit, marking, materials, parts, and finish for conformance to the requirements specified herein.

4.5.2 Operating test. The Converter-Shift Register Group, and the Converter Unit independently, shall be energized and subjected to an operating test to insure qualitatively the proper functioning of the equipment. This test shall include but not be limited to steps to verify compliance with the requirements of 3.5.4, 3.5.5, 3.6, 3.7 herein.

4.6 Reliability demonstration test. The reliability of the equipment shall be demonstrated and reported in accordance with MIL-STD-781. The reliability test

shall be performed at test level A1 and test plan XXV for the initial production unit. The specified MTBF (θ_0) shall be 2500 hours for the reliability test. The reliability test shall be successfully completed prior to Government acceptance of any equipment.

4.6.1 Reliability test plan. The contractor shall prepare a detailed test plan describing the procedures, in accordance with MIL-STD-781 to be used for the reliability test. Test parameters and conditions shall be in accordance with the equipment operational requirements as defined in the equipment specification. Performance parameters to be measured during the reliability test shall be in accordance with the equipment specification. Debugging and burn-in prior to the reliability test shall be limited to the debugging and burn-in to be performed on all production equipment prior to delivery to the Government. No preventative maintenance shall be performed during the reliability test. At least ninety (90) days prior to the start of the reliability test, the contractor shall submit a reliability test plan to the procuring activity for Government approval, with an information copy to NAVELEX Code 047.

4.6.2 Failure. Failure shall be defined as any malfunction or parameter deviation that prevents the equipment from performing within the operational requirements set forth herein. All failures shall be considered relevant unless determined by the procuring activity to be caused by a condition external to the equipment under test which is not a test requirement and not encountered in service. Only relevant failures shall be counted during the reliability test for an accept or reject decision.

4.6.3 Reliability test report. The contractor shall submit a report on the procedures, results, test data and conclusions of the reliability test. All test records shall be submitted with the reliability test reports. The reliability test report shall be submitted to the procuring activity, for approval, with an information copy to NAVELEX 047, within twenty (20) days after completion of the reliability test.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing and marking. Unless otherwise specified preparation for delivery shall be in accordance with the applicable levels of preservation and packaging, packing and marking specified in MIL-E-17555 (see 6.2).

(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 or order. Preparation for delivery requirements for products procured by contractor shall be specified in the individual order).

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6. NOTES

6.1 Intended use. The AN/UGA-3() equipment, in association with standard Navy radio receiving equipment is intended to supplement or supplant manual reception in International Morse circuits. It may be used in all classes of ships, and must be designed for continuous operation under adverse operating, maintenance and environmental conditions.

6.2 Ordering data. Procurement document should specify the following:

- (a) Title, number, and the date of this specification.
- (b) Preparation for delivery if other than specified herein (see 5.1).

Preparing activity:
Navy - EC
(Project 5815-N049)