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30 June 1981
SUPERSEDING
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13 June 1975

MILITARY SPECIFICATION

CHASSIS ASSEMBLY: 10559435 PHOTOMULTIPLIER

This specification is approved for use by the US Army Armament Research and Development Command (ARRADCOM) and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the requirements and quality assurance provisions for the Chassis Assembly: 10559435 Photomultiplier which is the A6 component of the Receiver-Transmitter Unit, 11743121.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

MILITARY

MIL-F-13926	Fire Control Materiel: General Specification Governing the Manufacture and Inspection of
MIL-I-45607	Inspection Equipment, Supply and Maintenance of
MIL-STD-45662	Calibration System Requirements

FSC: 1240

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Armament Research and Development Command, Attn. DRDAR-QA, Dover, New Jersey 07801 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

STANDARDS

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-810	Environmental Test Methods

DRAWINGS

ARRADCOM

10559435	Chassis Assembly, Electronic Equipment - Photomultiplier, A6
10559314	Schematic Diagram - Phototube Bias Network

Inspection Equipment

11750212	Test Set - PMT, Bias and Optical

Packaging Data Sheet

P10559435	Chassis Assembly: Photomultiplier

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

3. REQUIREMENTS

3.1 Fabrication. The photomultiplier tube (PMT) chassis assembly, herein referred to as the assembly, shall be manufactured in accordance with Drawing 10559435 and drawings pertaining thereto and, when assembled, shall meet the requirements of this specification. (See 4.5.1)

3.1.1 Function. The assembly shall provide the following functions:

	Designation	Nomenclature
a.	Zero volts	Automatic Gain Control (AGC) inhibit
b.	27 volts	AGC test
c.	+5 volts	Time Programmed Gain (TPG) reduction
d.	Zero decrease	TPG inhibit

3.1.2 General specifications. The follwing provisions of MIL-F-13926 apply: (See 4.5.1)

a. Order of precedence
b. Dimensions and tolerances
c. Inorganic protective surface finishes
d. Part identification and marking
e. Workmanship

3.1.3 Ambient conditions. Standard ambient conditions shall be as follows:

a.	Temperature	$73^{o} \pm 18^{o}F$
b.	Relative humidity	50 percent $\pm$ 30 percent
c.	Atmospheric pressure	28.5 + 2.0 -3.0 in. Hg.

3.2 First article. When specified (see 6.2), the contractor shall furnish sample units for first article inspection and approval (see 4.4 and 6.2).

3.3 Performance. Unless otherwise specified, the assembly shall meet the performance requirements specified herein under standard ambient conditions of 3.1.3.

3.3.1 AGC. (See 4.6.2.1)

3.3.1.1 AGC inhibit test. With J1-3 connected to J1-4, the analog signal, source of table I applied to J1-6 and set to -0.7 $\pm$ 0.2 volt and the (1.5 $\pm$ .04) x 10^{-10} watt beam source of table I directed as specified, the voltage at J1-5 shall be 0 $\pm$ 1 volt.

3.3.1.2 AGC test. With the condition of 3.3.1, a change of analog signal to +0.7 ± 0.2 volt shall decrease the PMT anode current at J2 by not less than 10 nanoamperes (nA), and the voltage at J1-5 shall be 27 ± 3 volts.

TABLE I. Power and signals.

Item	Condition	Characteristics	Connections
		Maximum	
1.0	Power sources	Tolerance p-p ripple	Applied between the following pins of J1:
1.1	-6 Volts	±0.2 Volts 25mV	3(+) and 2(-)
1.2	+5 Volts	±0.2 Volts 25mV	1(+) and 3(-)
1.3	+29 Volts	±1 Volt 25mV	7(+) and 3(-)
1.4	-2180 Volts	±40 Volts 100mV Source Impedance: 480K OHMS ± 5%	A1(-) and 3(+)
2.0	Signal sources		
2.1	Digital type-A	Logical one: 4 ± 1 Vdc Logical zero: 0.2 ± 0.2 Vdc Source impedance: 6K OHMS, ± 5%	Applied to terminal J1-10 when specified
2.2	Analog	-1V adjustable, Source impedance: 47 MEG OHMS ± 5%, + 1V adjustable, source impedance: 1K OHMS ± 5%	Applied to terminal J1-6 when specified
2.3	Beam source	Collimated within 2 deg. diameter 0.090 ±0.005 inch; delivering (1.5 ±.04) x 10^{-10} watt within a 100 Angstrom band centered at 6943 Angstrom	Directed to PMT enhancement prism for maximum output at J2

3.3.2 TPG control. (See 4.6.2.2)

3.3.2.1 Gain reduction test. With J1-5 connected to J1-3, the type-A logical-one signal of table I applied to J1-10 and the beam source of table I directed as specified and set to (1.5 ±.04) x 10^{-10} watt, a change of the type-A signal at J1-10 to logical zero shall decrease the power gain of the PMT by not less than 20 db and the voltage at J1-4 shall be +5.0 ± 0.2 volts.

3.3.2.2 Gain reduction inhibit test. With the conditions of 3.3.2.1 and the type-A logical zero applied to J1-10 and J1-4, there shall be no decrease in the power gain of the PMT.

3.4 Environmental.

3.4.1 Shock. The assembly shall be capable of operating as specified herein after exposure under the conditions of 3.1.3 to three half sine wave shock pulses of 40 ± 4 gravity unit (g) for a duration of 18 ± 3 milliseconds (msec) applied in each direction along three mutually perpendicular axes. In addition, the assembly shall be capable of withstanding three half sine wave shock pulses of 100.0 ± 10.0 g for a duration of 1.5 ± 0.2 msec applied in each direction along three mutually perpendicular axes. (See 4.6.3.1)

3.4.2 Vibration. The assembly shall be capable of operating as specified herein after exposure under the conditions of 3.1.3 to the vibration profile of figure 1. Duration of exposure shall be not less than 80 minutes in each of three mutually perpendicular axes. (See 4.6.3.2)

3.4.3 Operating temperature. The assembly shall be capable of operating as specified herein over the operating temperature range of -25°F to +125°. (See 4.6.3.3, 4.6.3.4 and 4.6.3.5)

3.4.4 Storage temperature. The assembly shall be capable of operating as specified herein after exposure to storage temperatures ranging from -65°F to 160°F. (See 4.6.3.3, 4.6.3.4 and 4.6.3.5)

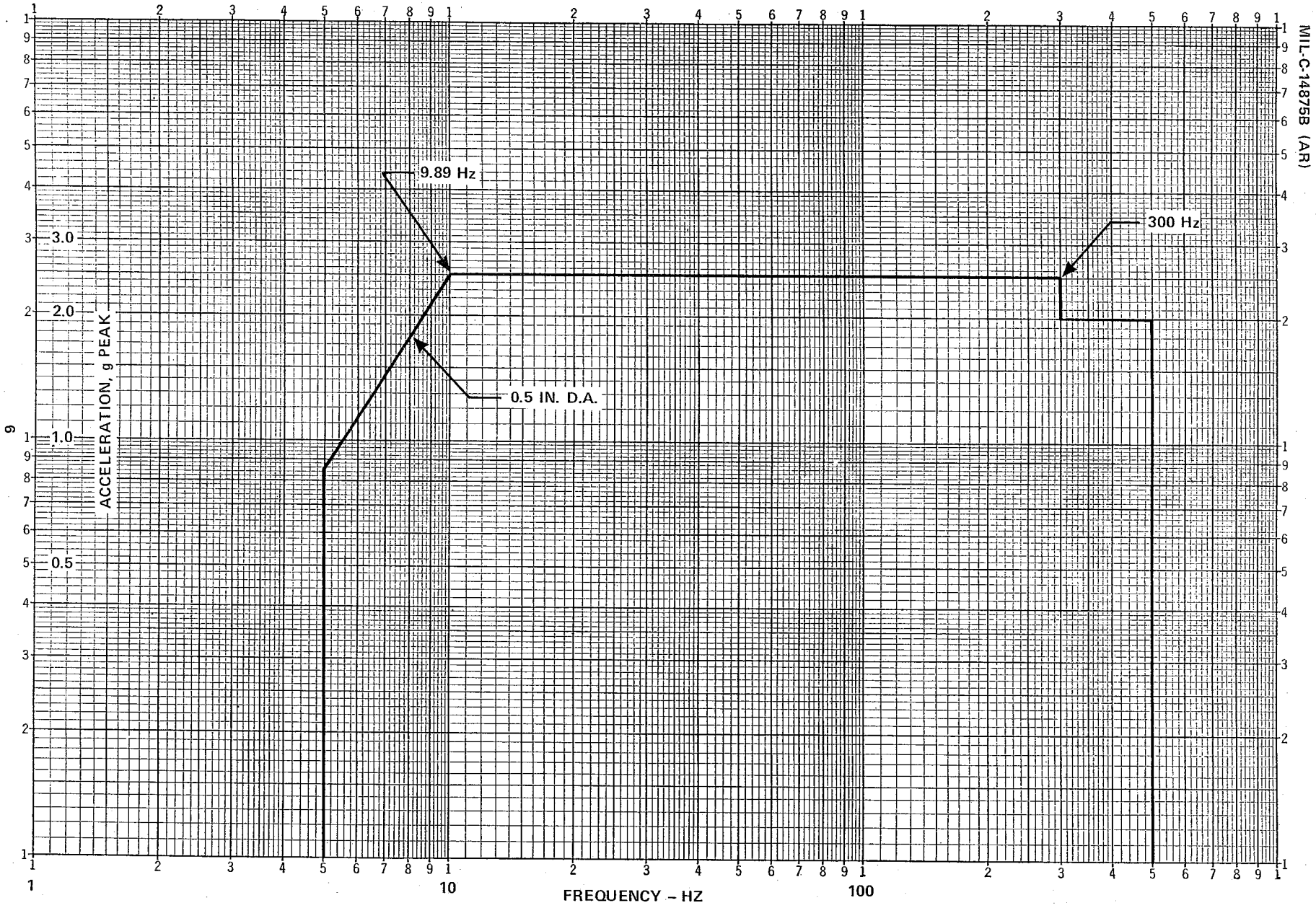

FIGURE 1. Vibration profile.

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.

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

1. First article inspection (see 4.4).
2. Quality conformance inspection (see 4.5).

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the quality assurance provisions of MIL-F-13926 and the conditions of 3.1.3.

4.4 First article. The requirement for first article approval and the designation of responsibility for first article inspection to either the Government or the contractor shall be specified in the contract.

4.4.1 Sample. The first article sample shall be three assemblies selected at random by the Government representative from the first fifteen production assemblies.

4.4.2 Inspection. The sample shall be subjected to all the inspections specified in tables II, III and IV.

4.4.3 Failure. Failure of any assembly to meet any requirement shall be cause for refusal to grant first article approval. The Government reserves the right to terminate first article inspection upon any failure of any assembly to comply with any stated requirement.

4.4.4 Responsibility. The contractor, whether or not responsible, shall inspect the sample for conformance to all contractual requirements and shall submit a record of this inspection with the sample and certificates of conformance for materials. The Government reserves the right to witness inspections performed by the Contractor.

4.5 Quality conformance inspection.

4.5.1 Procurement conditions. The following inspection plans shall apply where the subassembly is procured for use as a:

Use	Plan
a. Logistics spare assembly apart from the next higher assembly	A and C
b. Component assembly of the next higher assembly	B and C

4.5.2 Inspection plan A.

4.5.2.1 General sample and tests. One assembly, as a control sample, shall be selected at random by the Government representative from each 100 assemblies produced and shall be subjected to all the tests in table III.

4.5.2.2 Environmental sample and tests. Three assemblies, as a control sample, shall be selected at random by the Government representative from each 50 assemblies produced or from each month's production, whichever occurs first. All the tests in table IV shall be applied separately to each assembly in the sample.

4.5.2.3 Acceptance. Where any one assembly of either sample fails to meet any specified requirement, the lot shall be rejected. Rejected lots shall be subject to the provisions of MIL-STD-105.

4.5.3 Inspection plan B.

4.5.3.1 Sample and tests. The sample shall be selected by the Government representative in accordance with the provisions of MIL-STD-105. All the tests in table III and only the test of item 307 in table IV shall be applied.

4.5.3.2 Acceptance. Acceptance and rejection shall be in accordance with MIL-STD-105.

4.5.4 Inspection plan C.

4.5.4.1 Sample and tests. Each assembly in every lot shall be subjected to all the tests in table II and shall be examined visually for completeness, improper assembly and evidence of poor workmanship.

4.5.4.2 Acceptance. Where any one assembly fails to meet any specified requirement, the defective assembly shall be removed from the lot and resubmitted only after all defects have been corrected.

4.5.5 Inspection equipment. Unless otherwise specified in the contract, the contractor shall supply, maintain and calibrate inspection equipment in accordance with the provisions of MIL-I-45607 and MIL-STD-45662.

4.5.6 Packaging inspection. The sampling and inspection of the preservation - packaging, packing and container marking shall be in accordance with the provisions of packaging data sheet P10559435.

TABLE II. Performance tests.

Item	Characteristic	Requirement	Test Procedure
101	APG	3.3.1	4.6.2.1
102	TPG Control	3.3.2	4.6.2.2

TABLE III. General tests.

Item	Characteristic	Requirement	Test Procedure
301	Fabrication	3.1	Applicable drawings - Visual
302	General Specification	3.1.2	MIL-F-13926 - Visual

TABLE IV. Environmental tests.

Item	Characteristic	Requirement	Test Procedure
303	Shock	3.4.1	4.6.3.1
304	Vibration	3.4.2	4.6.3.2
305	High Temperature	3.4.3 and 3.4.4	4.6.3.3
306	Low Temperature	3.4.3 and 3.4.4	4.6.3.4
307	Temperature Cycling	3.4.3 and 3.4.4	4.6.3.5

4.6 Methods of inspection.

4.6.1 Test equipment. Unless the assembly is procured apart from the next higher assembly, the test equipment in table V shall be used where specified to perform the required test.

TABLE V. Test equipment.

Item	Part Number	Nomenclature
1	11750212	Test Set - PMT, Bias and Optical

4.6.2 Performance tests.

4.6.2.1 AGC. Use item 1 of table V or suitable equipment to determine compliance with 3.3.1.

4.6.2.2 TPG control test. Use item 1 of table V or suitable equipment to determine compliance with 3.3.2.

4.6.3 Environmental tests.

4.6.3.1 Shock.

4.6.3.1.1 Basic design. Mount the assembly in a suitable shock fixture and subject it to the shock test specified in MIL-STD-810, method 516.2, procedure I figure 516.2-2. Apply three half sine wave shock pulses in each direction along the three axes. Peak amplitude shall be 40 ± 4 g with a time duration of 18 ± 3 msec measured at the 10 percent amplitude points. At the conclusion of this test, subject the assembly to the performance tests of table II.

4.6.3.1.2 High intensity. Mount the assembly in a suitable shock fixture and subject it to the shock test specified in MIL-STD-810, method 516.2, procedure IV, figure 516.2-2. Apply three half sine wave shock pulses in each direction along the three axes. Peak amplitude shall be 100.0 ± 10.0 g with a time duration of 1.5 ± 0.2 msec measured at the 10 percent amplitude points. At the conclusion of this test, subject the assembly to the performance tests of table II.

4.6.3.2 Vibration. Vibration A as specified in 4.6.3.2.1 shall be conducted only for first article inspection. Vibration B as specified in 4.6.3.2.2 shall be conducted only for quality conformance inspection.

4.6.3.2.1 Vibration A. Mount the assembly in a suitable vibration fixture and subject the assembly to the vibration test specified in MIL-STD-810, method 514.2, procedure VIII, except that the test level shall be the vibration curve shown in figure 1 and duration of exposure shall be not less than 80 minutes per axis. At the conclusion of this test, subject the assembly to the performance tests of table II.

4.6.3.2.2 Vibration B. This test shall be conducted as in 4.6.3.2.1 except that the period of vibration shall be not less than 15 minutes in each axis.

4.6.3.3 High temperature. Subject the assembly to the high temperature test specified in MIL-STD-810, method 501.1, procedure I. The highest operating temperature shall be 125°F. The performance tests of table II shall be applied.

4.6.3.4 Low temperature. Subject the assembly to the low temperature test specified in MIL-STD-810, method 502.1, procedure I. The storage temperature shall be -65°F. The lowest operating temperature shall be -25°F. The performance tests of table II shall be applied.

4.6.3.5 Temperature cycling. With power and loads of table I applied, subject the assembly to the temperature profile specified in figure 2. At the conclusion of this test, subject the assembly to the performance tests of table II.

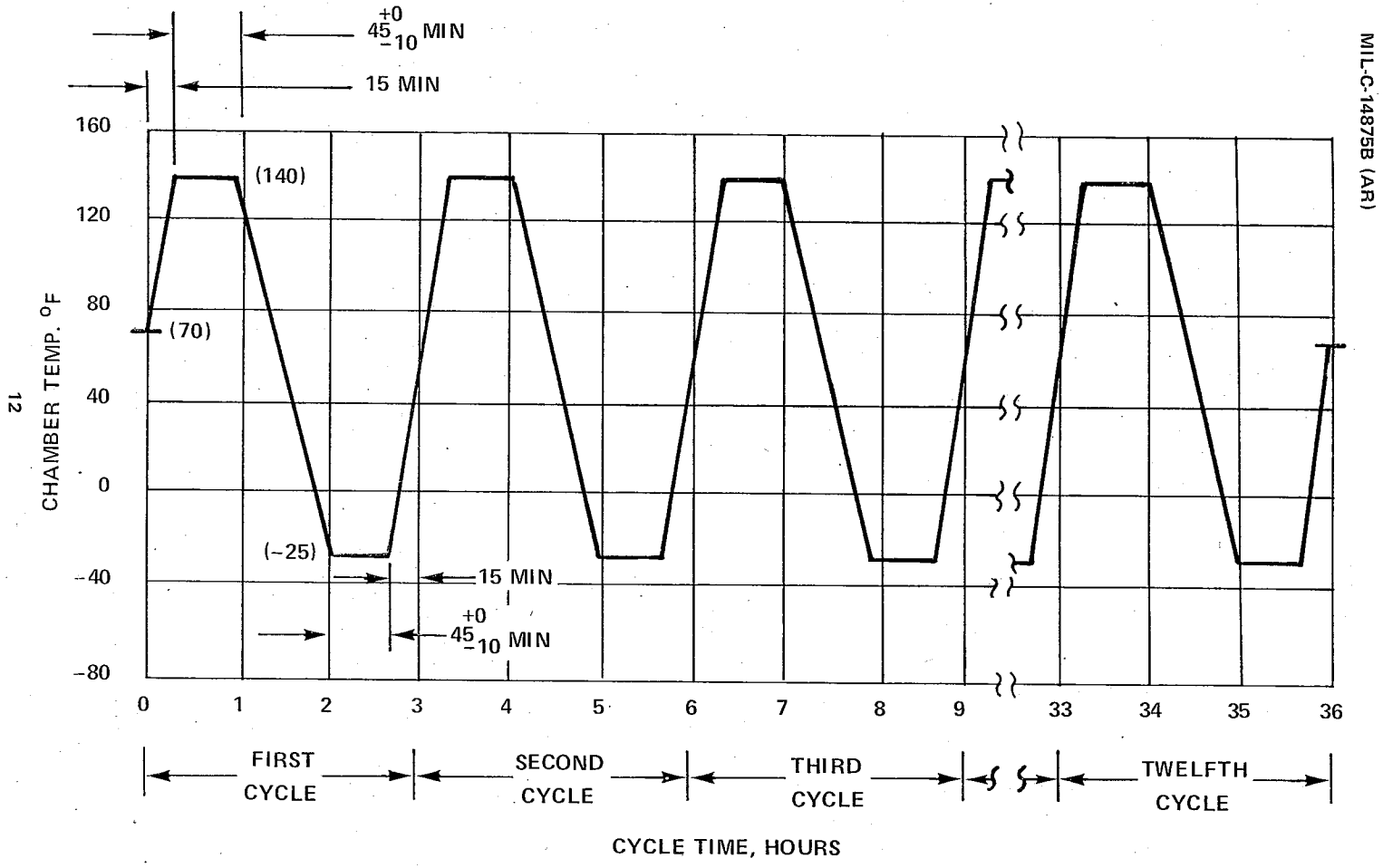

FIGURE 2. Temperature cycling.

5. PACKAGING

5.1 Packaging, packing and marking. Packaging, packing and marking shall be in accordance with packaging data sheet P10559435. The level of protection shall be as specified in the procurement document. (See 4.5.6)

6. NOTES

6.1 Intended use. The PMT chassis is an assembly of the Laser Receiver-Transmitter, intended for use in the Laser Range Finder AN/VVS-1. Its functions are as follows: (Common to AN/VVG-2 L.R.F.)

a. Provides dynode biasing for the photomultiplier tube.

b. Supplies the TPG and AGC to the amplifying characteristics of the PMT.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number and date of this specification.

b. Applicable packaging daa sheet number (se 5.1).

c. Selection of applicable levels of preservation, packaging and packing.

d. Applicable stock number.

e. Requirement for first article submission.

6.3 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.

Custodian:

Army-AR

Preparing Activity

Army-AR

Project No. 1240-A790