

NOTICE OF CHANGE

METRIC

MIL-STD-1540B (USAF)
 NOTICE 3
 12 FEB 91

MILITARY STANDARD
 TEST REQUIREMENTS FOR SPACE VEHICLES

TO ALL HOLDERS OF MIL-STD-1540B (USAF)

1. This change notice incorporates special pyro shock screening tests for components that contain nonpassivated microelectronic parts. THE FOLLOWING PAGES OF MIL-STD-1540B (USAF) HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

<u>NEW PAGE</u>	<u>DATE</u>	<u>SUPERSEDED PAGE</u>	<u>DATE</u>
67	12 FEB 91	67	10 OCTOBER 1982
68	10 OCTOBER 1982	68	REPRINTED WITHOUT CHANGE
70c	12 FEB 91	-	(NEW PAGE)
70d	12 FEB 91	-	(NEW PAGE)

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.
3. Holders of MIL-STD-1540B (USAF) will verify that page changes indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the Military Standard is completely revised or cancelled.

Custodian:
 Air Force - 19

Preparing Activity:
 Air Force - 19

(Project Number 1810-F047)
 Doc 2554b Arch 1443b

AMSC N/A

FSC 1810

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TABLE IV. Component Acceptance Tests

TEST	Reference Paragraph	Suggested Sequence	Electronic or Electrical Equipment	Antennas	Moving Mechanical Assemblies	Solar Panel	Batteries	Valves	Fluid or Propulsion Equipment	Pressure Vessels	Thrusters	Thermal Equipment	Optical Equipment
Functional	7.3.1	1(1)	R	R	R	R	R	R	R	R	R	R	R
Thermal Vacuum	7.3.2	7	R(2)	O	R	O	R	R	R	O	R	R	R
Thermal Cycling	7.3.3	6	R	O	O	O	O	R	R	-	-	-	-
Random Vibration	7.3.4	4	R	R(4)	R	-	O	R	R	O	R	R	R
Acoustic	7.3.5	4	O	R(4)	-	O	-	-	-	-	-	-	-
Pyro Shock	7.3.6	3	R(5)	-	O	-	-	-	-	-	-	-	O
Pressure	7.3.7	9	-	-	O(3)	-	R(3)	R	R	R	O	-	-
Leak	7.3.8	2,5,10	R(3)	-	R(3)	-	R(3)	R	R	R	O	-	-
Burn-in	7.3.9	6	R	-	O	-	-	R	-	-	R	-	-

Legend: R = Required
 O = Optional test
 - = No requirement

Notes: (1) Functional tests shall be conducted prior to and following environmental test.
 (2) Required only on unsealed units and on high power RF equipment.
 (3) Required only on sealed or pressurized equipment.
 (4) Either random vibration or acoustic test required with the other optional.
 (5) This test is optional if optional criteria per 7.3.6.4 in NOTICE 3 is met

deviations from the baseline of required tests shall be approved by the contracting officer. Component acceptance tests shall normally be accomplished entirely at the component level. However, in certain circumstances, the required component acceptance tests may be conducted partially or entirely at the subsystem or space vehicle levels of assembly. Acceptance tests of components such as interconnect tubing, radio frequency circuits, and wiring harnesses are examples where at least some of the tests can usually be accomplished at higher levels of assembly.

Where components fall into two or more categories of Table IV, the required tests specified for each category shall be applied. For example, a star sensor may be considered to fit both "Electronic Equipment" and "Optical Equipment" categories. In this example, a thermal cycling test would be conducted since

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it is required for electronic equipment, even though there is no requirement for thermal cycling optics. Similarly, an electric motor-driven actuator fits both "Electrical Equipment" and "Moving Mechanical Assembly" categories. The former makes thermal cycling a required test, even though this test is optional for the moving mechanical assembly category.

7.3.1 Functional Performance Test, Component Acceptance

7.3.1.1 Purpose. This test verifies that the electrical and mechanical performance of the component meets the specified operational requirements of the component.

7.3.1.2 Test Description. Same as 6.4.1.2.

7.3.1.3 Supplementary Requirements. Same as 6.4.1.3.

7.3.2 Thermal Vacuum Test, Component Acceptance

7.3.2.1 Purpose. This test detects material and workmanship defects prior to installation into a space vehicle, by subjecting the unit to a thermal vacuum environment.

7.3.2.2 Test Description. Same as 6.4.2.2.

7.3.2.3 Test Levels/Duration

- a. Pressure. The pressure shall be reduced from atmospheric to 0.0133 pascals (0.0001 Torr) or less.
- b. Temperature. The high temperature shall be the maximum predicted but not less than +61 deg C, and the low temperature shall be the minimum predicted temperature but not higher than -24 deg C, except where the temperature extreme would result in physical deterioration of the materials in the component such as in tape recorders and batteries.
- c. Duration. A minimum of one temperature cycle shall be used. The cycle shall have a 12-hour dwell at the high and at the low temperature levels during which the unit is turned off until the temperature has stabilized and then turned on.

7.3.2.4 Supplementary Requirements. Same as 6.4.2.4.

7.3.3 Thermal Cycling Test, Component Acceptance

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When this NOTICE is invoked, replace the Component Acceptance Pyro Shock Screening Test requirements in paragraph 7.3.6 with the following:

7.3.6 Pyro Shock Screening Test, Component Acceptance

7.3.6.1 Purpose. This test is intended to detect the presence of conductive particles in nonpassivated piece parts incorporated in electronic components. It is effective for particle detection, since shock can dislodge particles and extended vibration causes particle migration to positions where malfunctions may occur. It is also intended to reveal material and workmanship defects in components subject to high-amplitude in-flight shock environments.

7.3.6.2 Test Description. The component shall be attached at its normal points to the same fixture or structure used for its pyro shock qualification test. The unit shall be electrically energized and monitored. The test technique employed shall be identical to that selected for its qualification, differing therefrom only in level and the number of repetitions. For components with nonpassivated microelectronic parts, a special vibration test shall be performed during which the component shall be sequenced through all possible operating modes, including redundancy and circuits monitored for intermittents and shorts. A functional test of the unit shall be performed before and after the pyro shock test and after the vibration screening test. The vibration screening test may be omitted for components containing no nonpassivated parts, provided the random vibration test is next in the acceptance test sequence. Passivation in this context, refers to piece parts, such as semiconductors, which have a grown insulating layer on their surface which provides physical protection from contamination such as pyrotechnic debris. The component shall be electrically energized and functionally sequenced through all possible operating modes, including redundancy, during the testing. Circuits should be monitored for intermittents. A functional test shall be conducted before and after the pyro shock test and after the vibration screening test.

7.3.6.3 Test Levels and Duration. A pyro shock test shall be performed once in both directions of each of three mutually perpendicular axes at maximum predicted levels as defined in 3.22. The screening vibration test level shall be 3 dB below the acceptance test level specified in 7.3.4.3, but no lower than 4.5 g rms. Each test shall consist of 5 minutes dwell test followed by vibration bursts consisting of 10 seconds "on" and 10 seconds "off." The number of bursts shall be such that all circuits are monitored at least 10 times during the burst sequence with a minimum number of 20 bursts.

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7.3.6.4 Supplementary Requirements. Rather than basing the screening vibration test on the expected flight vibration spectrum, a special-purpose spectrum may be developed. To be effective, the screening vibration spectrum imposed on the component should cause circuit boards within to vibrate at a level of 5 to 10 grms with a flat spectrum from 10 to 450 Hz. The required input spectrum may be defined from results of developmental vibration survey tests or analytical response predictions.

The screening test incurs exposure of the component to vibration in addition to that experienced in the acceptance vibration test. The additional exposure is defined by the screening spectrum based on the expected flight shape, or by the specially developed spectrum if that option is selected. In either case, the component qualification levels and durations specified in this standard shall be assessed to assure they provide a sufficient margin to safely conduct the screening test.

The pyro shock acceptance is optional if the maximum expected shock environment for components with no nonpassivated parts is less at all frequencies than the shock response spectrum (for $Q = 10$) given by:

$$g = 0.8 f \quad (\text{for } Q = 10)$$

where f = frequency, Hz