PRODUCT SPECIFICATION

for

TERMI-POINT CLIPS

.031" x .093"

1. SCOPE

This Specification contains performance requirements and test procedures for the Qualification of AMP .031" x .093" TERMI-POINT clips. The clips are designed to provide a reliable electrical and mechanical termination and will accommodate wire ranges of 20 and 24 AWG with maximum insulation diameters of .085 inch.

2. APPLICABLE DOCUMENTS

The following specifications and standards form a part of this specification to the extend specified herein.

2.1. Military Specifications.

Mil-W-16878	Wire, Electrical, Insulated High Temperature.
Mil-Std-202	Test Methods for Electronic and Electrical Component Parts.

2.2. ASTM Specifications

ASTM 511B103	Phosphor Bronze.

2.3. AMP Specifications

109-1	Definitions of Terms and Methods used in AMP Specifications.
109-3	Millivolt Drop Method for Measuring Resistance of Electrical Connections.

3. REQUIREMENTS

3.1. Qualifications.

TERMI-POINT Clip terminations shall be designed to meet the mechanical and electrical performance requirements specified herein.
To verify compliance to the performance requirements of this specification, the quantity of test samples specified in paragraph 4, 5, shall be submitted to the Qualification Test sequence in Table V.

3.1. Definitions.

For the purpose of this specification, the following definitions shall apply :

3.2.1. Termination . . . A Termi-Point Clip termination consists of a length of insulated wire, automatically stripped, compressed, and wiped along the Terminal Post during the termination process.

3.2.2. Insulation Support . . . The pre-formed area of the Clip which holds the insulation secure to prevent movement of the wire during flexing, vibration, etc.

3.2.3. Contact Area . . . The stripped area of the wire which is in intimate contact with Terminal Post and Clip.

3.2.4. Web . . . . The body of the Clip which presses the stripped wire against the Terminal Post.

3.2.5. Strain Relief . . . . Outward flange immediately behind insulation support to prevent wire nicking.

3.2.6. Crown . . . . Outward embossing of Clip Web to control bundling of stranded wire during application.

3.2.7. Serrations . . . . Internal cross scoring at the crown to prevent wire slippage relative to Clip during application and to provide electrical redundancy.

3. REQUIREMENTS (cont.d.)

3.3. Clip Material.

Material used to manufacture Clips shall be Phosphor Bronze in accordance with ASTM 511B103, tensile strength 615 - 670 N/mm2. Use of other materials shall be permitted providing the Clip is capable of meeting the performance requirements specified herein.

3.4. Post Design.

Terminal Post shall be as designed and manufactured by AMP.

3.5. Clip Plating.

Clip shall be pre-tin plated hot dipped.
Thickness of plating shall be as specified on the applicable product drawing.

3.6. Terminal Post Finish/Plating.

Terminal Post shall be as finished and plated by AMP.

3.7. Performance Requirement - Mechanical.

3.7.1. Visual Examination.

Each test sample shall be thoroughly examined prior to Qualification Tests. The examination of samples shall be conducted in accordance with Paragraph 4.3. During the examination, all requirements specified herein shall be met. Failure to meet any one requirement shall be cause for failure requiring new sample preparation.
Individual sample inspection shall include :

1. Stripped wire shall be visible beyond end of Clip.
2. Clip curls must grip Post in correct manner.
3. Clips must not over-ride one another.
4. The first Clip applied to Post shall not bottom on panel or chamfer of Post. The minimum distance between Clip and Panel or Post chamfer shall be at least equal to the insulation diameter of the terminated wire.

(3.7.1. cont.d.)

5. Each termination shall meet the performance requirement for Clip Retention as specified in Paragraph 3.7.2.

3.7.2. Clip retention of terminations shall be employed as a non-destructive inspection of sample quality to determine the mechanical and environmental effects on a test sample.
Clip retention tests shall be performed in accordance with Paragraph 4.6.1. during which the Clip may move in the lateral direction, or up to one-half the clip length and be considered acceptable, provided the minimum retention value specified is achieved.
Clip movement in excess of one-half the Clip length will be considered a failure.
The minimum retention required for various Clip sizes are listed in Table 1.

3.7.3. Wire Retention.

When tested as specified in Paragraph 4.6.2., the wire shall remain terminated until the minimum Wire Retention specified in Table 1 is achieved.

TABLE I.

Nominal Clip Size	.031" x .093"
20 Wire	2.25 pounds
24 Wire	2.25 pounds

3.7.4. Clip Retention after Bend Test.

When tested as specified in Paragraph 4.7.0. a termination shall be capable providing the minimum retention value specified in Table I.

3.8. Performance requirements - Electrical.

3.8.1. Rated Current Capacity

A termination shall be capable of continuously carrying the maximum current specified in Table II.

TABLE II

Wire Gage AWG	Rated Current Amperes
20 - -	5.0
24 - -	3.0

3.8.2. Current Overload.

When tested as specified in Paragraph 4.6.5., a termination shall be capable of carrying the test currents specified in Table III. After test, each termination shall meet the requirements for Termination Resistance, Paragraph 3.8.4.

TABLE III

Wire Gage AWG	Initial Overload (Amperes)	High Stress Overload (Amperes)
20	6.25	8.75
24	3.75	4.25

3.8.3. Low Level Conductivity.

When tested in accordance with Paragraph 4.6.4., terminations shall be capable of conducting current at an open circuit voltage of ten (10) microvolts.

3.8.4. Termination Resistance.

When tested with the method specified in Paragraph 4.6.3., the calculated Initial and Final (after test) resistance values shall not exceed the values specified in Table IV. Termination resistance shall be measured with an open circuit voltage not exceeding 50 milli-volts with a test current of 50 milli-amperes. All measurements shall be conducted with Direct Current.

TABLE IV

TERMINATION RESISTANCE

(Milli-ohms)

Wire Size	Initial	Final	Clip Designation
24 AWG	6.0.	8.0.	.031 x .093
20 AWG	4.0	6.0.	.031 x .093

3.9. Performance Requirements - Environmental

3.9.1. Corrosion Thermal Shock (Gas Tightness)

Upon completion of the test specified in Paragraph 4.6.6., termination shall meet the requirements for Low Level Conductivity Paragraph 3.8.3., Termination Resistance Paragraph 3.8.4. and Contact Area Examination Paragraph 3.9.5.

3.9.2. High Frequency Vibration.

Terminations shall experience vibration of 10 to 2000 Hz for a total of 12 hours when tested as specified in Paragraph 4.6.7. Throughout the test there shall be no evidence of electrical discontinuity in excess of 10 microseconds. Upon completion, the terminations shall meet the requirements of Termination Resistance, Paragraph 3.8.4.

3.9.3. Physical Shock.

Terminations shall experience a total of eighteen 100 G shock pulses when tested as specified in paragraph 4.6.8. Throughout the test, there shall be no evidence of electrical discontinuity in excess of one microsecond. Upon completion, the terminations shall meet the requirements of Termination Resistance, Paragraph 3.8.4.

3.9.4. Salt Spray.

Terminations shall be exposed to 48 hours of continuous salt spray when tested as specified in Paragraph 4.6.9.
Upon completion the terminations shall meet the requirements of Low Level Conductivity, Paragraph 3.8.3., Termination Resistance, Paragraph 3.8.4. and Clip Retention, Paragraph 3.7.2.

3.9.5. Corrosion and Thermal Shock.

Upon completion of Corrosion and Thermal Shock Test specified in Paragraph 4.6.6., each termination shall meet the requirements of Low Level Conductivity, Paragraph 3.8.3. and Termination Resistance, Paragraph 3.8.4.

3.9.6. Contact Area Examination.

Upon completion of Corrosion Thermal Shock, ten samples selected at random shall be examined for contact area (see Paragraph 3.2.1.)
Samples to be examined shall have the clip carefully removed from the terminal post exposing the contact area between the wire and terminal post.
The contact area will appear bright and in sharp contrast to the discolored area of the terminal post.

4. QUALITY ASSURANCE PROVISIONS

Selection of components, preparation of samples, examination and measurements shall be conducted in accordance with the following conditions.

4.1. Certification of Test Material.

Components selected for Qualification Test, including clip, terminal post, connectors and application tools shall be procured from current production and shall be certified to the dimensional requirements of the manufacturing drawing.

4.2. Preparation of Test Samples.

Preparation of test samples shall be in accordance with applicable AMP Instruction Material.
Samples shall be prepared using certified wire in accordance with Mil-W-16878 Type B, E, or ET for AWG 24.
For AWG 20 wires shall have semi-rigid PVC insulation.
For insulation diameter see applicable Product Drawing.

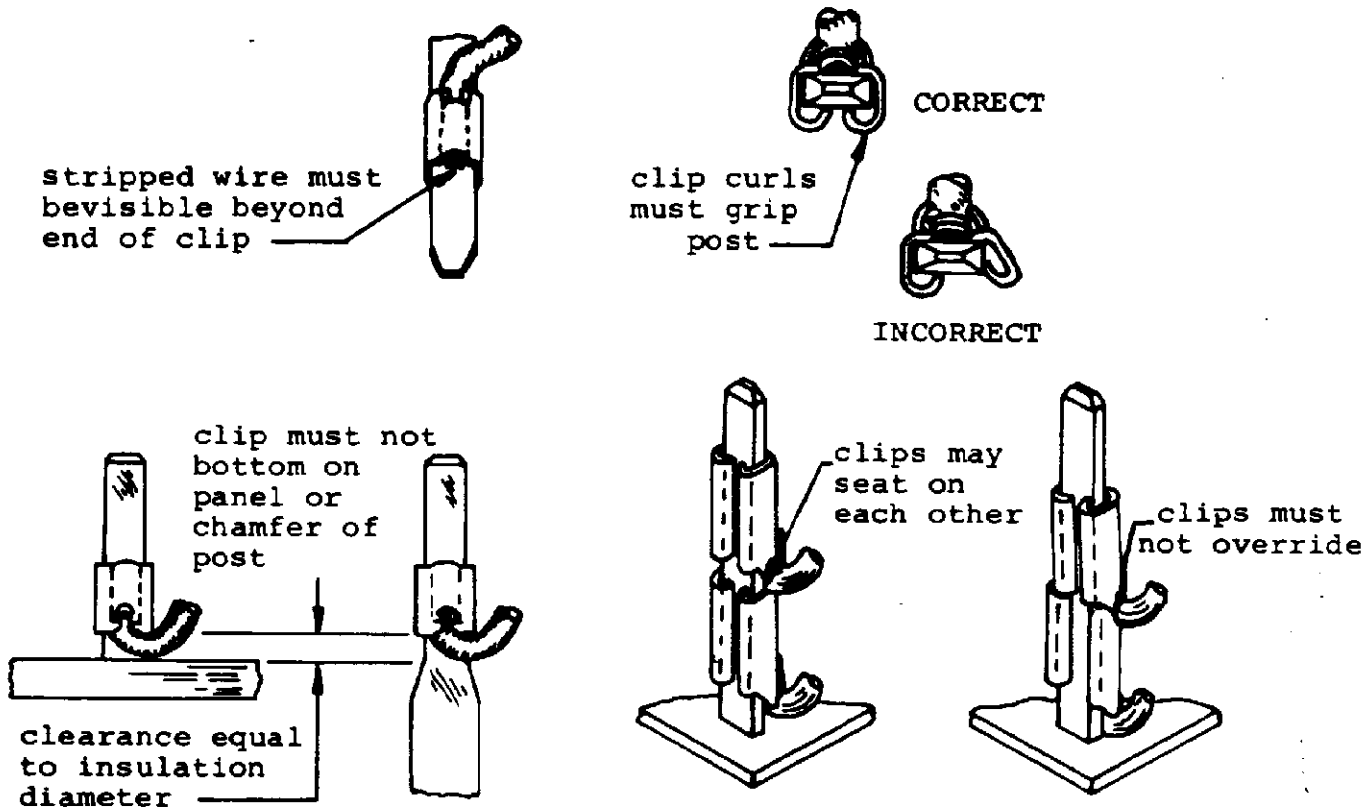
4.2.1. Workmanship.

Terminations shall be free from nicks, improper wire clearance between posts, damage to previously routed wire, or any other defect which could render the termination unsuitable for testing.

4.3. Examination of Test Samples.

During the preparation of test samples each termination shall be visually examined, see Figure 1, to assure conformance with Paragraph 3.7.1. Each sample shall also be subjected to the non-destructive Clip Retention Test, Paragrapgh 4.6.1. and meet the Clip Retention performance requirements specified in Paragraph 3.7.2.

FIGURE I
Examination of Product



4.4. Test Conditions.

Except as stated herein, standard test conditions shall conform to the requirements of Mil-Std-202.

4.4.1. Measurements shall be taken with instruments that have been calibrated and certified in accordance with Mil-C-45662.

4.5. Qualification Procedure.

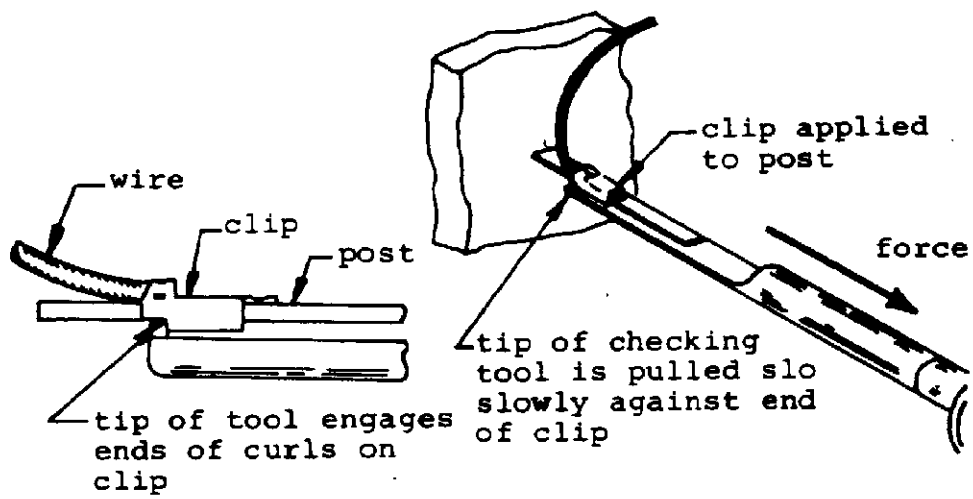
Test samples prepared and certified in accordance with Section 4.0. shall be submitted to the Qualification Test Sequence specified in Table V. A minimum of fifty test samples shall be submitted for each test group to perform Qualification Test.

4.6. Qualification Test Methods.

4.6.1. Clip Retention.

The terminal post shall be held in a fixed position and an axial force shall be applied to the Clip with a mechanical force gauge pulled at a rate of approximately ½ inch per second. The recommended procedure for attachment of force gauge is illustrated in Figure II.

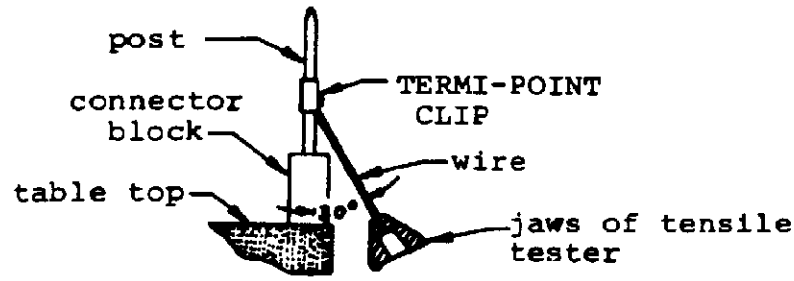
FIGURE II
Clip Retention



4.6.2. Wire Retention.

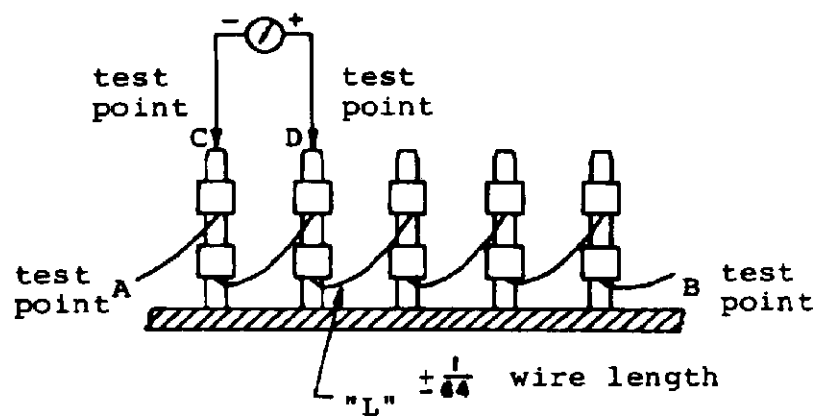
The terminal post shall be held firmly while an axial force is applied to the wire as illustrated in Figure III. The force applied to the terminal shall be applied by pulling the wire at a rate of 1 inch per minute, until the wire or clip is pulled from the terminal post.

FIGURE IV
Method for Determining Wire Retention



4.6.3. Termination prepared as illustrated in Figure IV shall be tested in the following manner.
The tests specimen shall be energized at points A and B with a Direct Current power source limited to an open circuit voltage of 50 millivolts. The test current shall be adjusted to 50 milli-amperes and the voltage drop measurements shall be measured at point C and D. The termination resistance shall be computed and the values derived shall be in accordance with Table IV. The termination resistance includes the resistance of "L" plus the contact resistance of two clips and terminal post. "L" dimension includes wire under clip and shall be precut ± 1/64 inch. "L" dimension for .031 x .093 clips shall be 2½ inches.

FIGURE III
Termination Resistance



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4.6.4. Low Level Conductivity.

A Direct Current power source adjusted to produce an open circuit voltage of ten (10) microvolts shall be applied at Test Point A and B of Figure IV. The current flow through the specimen shall be observed and the polarity of the source voltage reversed with the current gain noted.
Precaution shall be taken to insure that no voltage in excess of 10 micro-volts has been applied to the specimen prior to test.
Performance requirements for Low Level Conductivity are specified in Paragraph 3.8.3.

4.6.5. Current Overload.

Terminations shall be subjected to an initial overload current specified in Table II for a period of two hours. At the end of the two hour period the current shall be increased to the high stress overload current for a period of five minutes.
The current shall then be removed, and the samples allowed to return to room temperature.
Final termination resistance measurements shall be performed in accordance with Paragraph 4.6.3. to verify compliance to the performance requirements specified in Paragraph 3.8.4.

4.6.6. Corrosion - Thermal Shock.

Terminations shall be exposed to the combined environments specified herein and upon completion of one cycle the samples shall meet the performance requirements specified in Paragraph 3.9.1.

Hydrogen Sulfide - Phase 1.

The temperature of a closed desiccator shall be stabilized at $105^{\circ} + 2^{\circ}$ C.
The test samples shall be placed in the desiccator and the system shall be sealed and evacuated immediately until the pressure is reduced to 1 mm of mercury.
After the vacuum pump has been removed from the system and several minutes have been lapsed, a reading on a manometer gauge shall be observed and recorded.

4.6.6. (cont.d.)

If leaks have not been detected in the system, hydrogen sulfide gas shall be released gradually until the pressure in the system has been increased to 200 millimeters of mercury.
A hypodermic syringe shall then be used to inject one cc of water into the gas system, and the system shall be filled with hydrogen sulfide gas until the pressure is increased to 750 millimeters of mercury.
The environment established in the gas chamber shall be maintained for the period of one hour.
After the required exposure period, the gas shall be purged from the system through a bath of sodium hydroxide.

NOTE

Hydrogen sulfide gas is extremely toxid and the system should be purged with care through a concentrated solution of sodium hydroxide until the manometer tube indicates the pressure has been reduced to approximately 2 millimeters of mercury.

Low Temperature Environment - Phase II.

Immediately after the gas system has been purged, and the pressure allowed to return to ambient, the samples shall be removed from the desiccator and placed in the low temperature chamber for a period of one hour.
The ambient temperature of the chamber shall be -55° C $\pm$ 1° C at the time the samples are introduced to the thermal shock condition.
Completion of Phase I and II shall be considered as one cycle.

4.6.7. High Frequency Vibration.

Termination applied to a terminal post held in a fixture to simulate actual application shall be vibrated in accordance with Method 204.
Test Condition B of Mil-Std-202. Vibration shall be conducted in each of three planes as specified herein during which time, instrumentation shall be employed to detect electrical discontinuities greater than 10 micro-seconds in duration.
Vibration shall be performed in the sequence listed as follows.

4.6.7. (cont.d.)

Plane I : Vibration in the plane parallel to the length of the base shall be four hours in duration.

Plane II : Vibration in the plane parellel to the width of the base shall be four hours in duration.

Plane III : Vibration in the plane vertical to the base shall be four hours in duration.

4.6.8. Physical Shock.

Termination applied to terminal posts held in a fixture to simulate actual application shall experience three shock impulses in each of three planes as described herein.
Test should be conducted in accordance with Method 205 of Mil-Std-202 with each shock pulse 50 Gravity Units in magnitude, sustained for 11 ± 1 millesecond. Shock test shall be performed in the sequence listed below.
During the test, instrumentations shall be employed to detect electrical discontinuities greater than 10 microseconds in duration.

Plane I : Three shock pulses in the plane parallel to the length of the base.

Plane II : Three shock pulses in the plane parallel to the width of the base.

Plane III : Three shock pulses in the plane vertical to the base.

4.6.9. Salt Spray.

Terminations shall be subjected to salt spray in accordance with Test Condition B, Method 101 of Mil-Std-202.
Salt concentration during exposure shall be 20%.
The test samples shall be positioned at an angle of 45 degrees to the horizontal plane with the clip facing up.
Following exposure, the samples shall be rinsed with distilled water and permitted to dry at room temperature. After drying, the samples shall meet the performance requirement specified in Paragraph 3.9.4.

4.7.0. Wire Bend Test.

The terminated post shall be held in a fixed position. The free end of a 2 inch long connected wire will be held and be bent 90°, 5 times to the left and to the right.
During bending no special forces may be exerted on the wire. See Figure V.

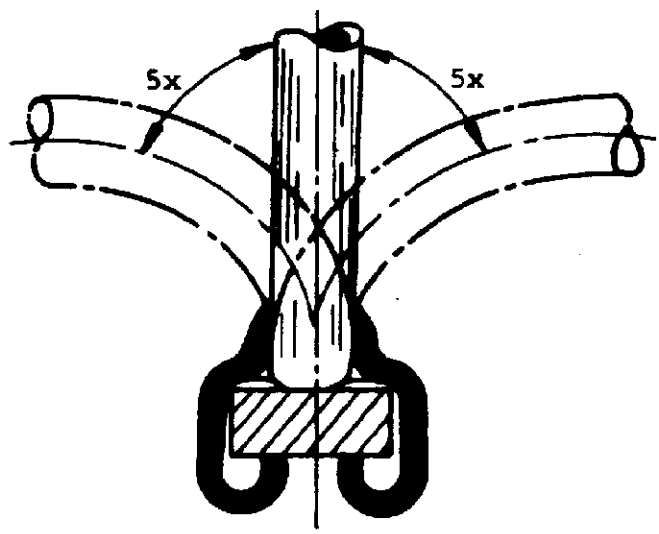

FIGURE V

QUALIFICATION TEST SEQUENCE

TABLE V

TEST SEQUENCE	METHOD PARAGRAPH
TEST GROUP I	
Visual Examination	4.3.
Terminations Resistance	4.6.3.
Current Overload	4.6.5.
Termination Resistance	4.6.3.
Clip Retention	4.6.1.
TEST GROUP II	
Visual Examination	4.3.
Corrosion - Thermal Shock	4.6.6.
Low Level Conductivity	4.6.4.
Termination Resistance	4.6.3.
Contact Area Examination	3.9.6.
Clip Retention	4.6.1.
TEST GROUP III	
Visual Examination	4.3.
Termination Resistance	4.6.3.
High Frequency Vibration	4.6.7.
Termination Resistance	4.6.3.
Clip Retention	4.6.1.
TEST GROUP IV	
Visual Examination	4.3.
Termination Resistance	4.6.3.
Physical Shock	4.6.8.
Termination Resistance	4.6.3.
Clip Retention	4.6.1.
TEST GROUP V	
Visual Examination	4.3.
Termination Resistance	4.6.3.
Salt Spray	4.6.9.
Low Level Conductivity	4.6.4.
Termination Resistance	4.6.3.
Clip Retention	4.6.1.

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NAME TERMI-POINT CLIPS .031" x .093"

Qualification Test Sequence

TEST SEQUENCE	METHOD PARAGRAPH
TEST GROUP VI	
Visual Examination	4.3.
Wire Retention	4.6.2.
TEST GROUP VII	
Visual Examination	4.3.
Wire Bend Test	4.7.0.