

**Cable, Planar Ribbon****1. INTRODUCTION****1.1. Purpose**

Testing was performed on AMP\* Planar Ribbon Cable to determine its conformance to the requirements of UL Style 2651 per Underwriters Laboratories Specification 758 Section G (1-24-94).

**1.2. Scope**

This report covers the electrical, mechanical, and environmental performance of the Planar Ribbon Cable manufactured by the Precision Cable Division of the Global Interconnect Systems Business.

**1.3. Conclusion**

The Planar Ribbon Cable listed in paragraph 1.5, meet the electrical, mechanical, and environmental performance requirements of UL Style 2651 per Underwriters Laboratories Specification 758 G (1-24-94).

**1.4. Product Description**

The AMP Planar Ribbon Cable is constructed of gray polyvinylchloride (PVC) insulation with tinned copper, stranded conductors. The size of the ribbon cable spans from 4-conductor to 64-conductor flat ribbon cable. Cable applications include radio, computer, and appliances.

**1.5. Test Samples**

The test samples were randomly selected from normal current production lots, and the following part numbers were used for test:

<u>Test Group</u>	<u>Quantity</u>	<u>Part Nbr</u>	<u>Description</u>
1	3	971111-5 rev. AC	40-conductor, 3 meters long
2	80	971111-5 rev. AC	40-conductor, 4 inches long
3	30	971111-5 rev. AC	40-conductor, 2 inches long
4	60	971111-5 rev. AC	40-conductor, 6 inches long
5	60	971111-5 rev. AC	40-conductor, 6 inches long
6	3	971111-5 rev. AC	40-conductor, 610 millimeters long

## 1.6. Qualification Test Sequence

Test or Examination	Test Groups					
	1	2	3	4	5	6
	Test Sequence					
Examination of Product	1,3	1,3	1,3	1,3	1,3	1,3
Dielectric Withstanding Voltage	2					
Physical Properties		2				
Deformation			2			
Flexibility				2		
Cold Bend					2	
Vertical Flame Test						2

**NOTE**

*Numbers indicate sequence in which tests are performed.*

## 2. SUMMARY OF TESTING

## 2.1. Examination of Product - All Groups

All samples submitted for testing were selected from normal current production lots. They were inspected and accepted by the Product Assurance Department of the Precision Cable Division.

## 2.2. Dielectric Withstanding Voltage - Group 1

No dielectric breakdown or flashover occurred when a test voltage was applied between water and the insulated sample conductor.

## 2.3. Physical Properties - Group 2

The tensile strength and elongation of the aged samples met the requirement of being at least 70% and 65+%, respectively, of the values for unaged samples.

## 2.4. Deformation - Group 3

All samples met the requirement of <50% reduction of the outside diameter of the insulated cable after heat aging and weight force, when compared to initial thickness measurements.

## 2.5. Flexibility - Group 4

No cracks, breaks or delaminations were visible at the bend on samples before heat exposure and during heat exposure after being wrapped around a steel rod.

## 2.6. Cold Bend - Group 5

No cracks, breaks or delaminations were visible at the bend on samples that were flexed into a U shape around a steel rod while subjected to -20 degree C.

## 2.7. Vertical Flame Test - Group 6

The cable did not flame either during or after the five applications of the test flame and no burning particles fell from the cable while vertically supported.

### **3. TEST METHODS, PER UL 1581 AND UL 83**

#### **3.1. Examination of Product**

Test samples were examined visually with a 10X eye loop for cracks, breaks and delamination of insulation and conductors before and after testing.

#### **3.2. Dielectric Withstanding Voltage**

The test cable was immersed in  $\approx$  6 inches of tap water for a period no less than 6 hours. While still immersed, a potential of 2000 volts was applied at a rate of 500 volts per second between the test cable and water and held for a period of 1 minute.

#### **3.3. Physical Properties**

The test samples were cut from a 4 inch section of ribbon cable. Each conductor was split from a 40-conductor cable. The conductor was removed from each sample, leaving only the insulation. 40 samples were tested as ambient control samples and 40 more samples were tested after being subjected to 136 degree C for 7 days. The ends of the PVC insulation were placed inside the jaws, spaced 1 inch apart and pulled at a rate of 2 inches per minute while measuring elongation and tensile strength.

#### **3.4. Deformation**

The test samples were cut in 2 inch sections from a 40-conductor ribbon cable and each conductor was split away. A weighted force-gage fixture was placed inside a heat oven until it reached 121 degree C. The test samples were then placed inside the heat oven along with the force gage for a period of 1 hour. After 1 hour exposure and still in the chamber, the samples were placed under the pressure-foot of the force gage for 1 hour with 250 grams applied. The samples were then removed from the pressure-foot and within 15 seconds, the out-side diameter of the test samples were measured at the spot in which the force was applied. Measurement of the out-side diameter was performed prior to heat exposure, after 1 hour heat exposure and after heat exposure with 250 grams of weight applied.

#### **3.5. Flexibility**

30, 6 inch samples were flexed around a 1/8 inch steel rod to form a U shape at ambient conditions and were examined at the bend area for cracks, breaks and delaminations. The other 30, 6 inch samples and a 1/8 inch steel rod were placed inside a heat oven for 7 days at 136 degrees C. After exposure and still in the oven, the samples were flexed around the steel rod to form a U shape and examined at the bend area for cracks, breaks and delaminations.

#### **3.6. Cold Bend Test**

The test samples along with a 1/8 inch steel rod were placed in a cold chamber for 1 hour at -20 degree C. After exposure, the samples were flexed around the steel rod to form a U shape while still in the chamber. Examination at the bend area for cracks, breaks and delamination was performed immediately after flexing the test samples.

#### **3.7. Vertical Flame Test, VW-1**

The vertically supported test samples were subjected to five, 15 second applications of a standard test flame with periods of 15 seconds between five successive applications of the test flame. The overall height of the flame was adjusted to approximately 4 to 5 inches. The blue inner cone was 1-1/2 inches high and the temperature of its tip was 816 degree C. The barrel of the gas burner was set at an angle of 20 degrees from the vertical test sample with the tip of the blue inner cone touching the test sample.

**4. VALIDATION**

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