# QUALIFICATION TEST REPORT

AMPLIMITE* HDF-20
Low Profile Connector

501-129 Rev. 0

| | |
|---|---|
| Product Specification: | 108-40012, Rev. 0 |
| CTL No.: | CTL4956-056-004 |
| Date: | September 28, 1990 |
| Classification: | Unrestricted |
| Prepared By: | Terrance M. Shingara |

*Trademark of AMP Incorporated

# Table of Contents

AMP

**AMP INCORPORATED**

HARRISBURG, PENNSYLVANIA 17105 PHONE: 717-564-0100 TWX: 510-657-4110

*CORPORATE TEST LABORATORY*

Qualification Test Report
AMPLIMITE HDF-20
Low Profile Connector

## 1. Introduction

### 1.1 Purpose

Testing was performed on AMP's AMPLIMITE HDF-20 Connector to determine its conformance to the requirements of AMP Product Specification 108-40012, Rev. 0.

### 1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the AMPLIMITE HDF-20 Connector, manufactured by the Interconnection Components and Assemblies Products Division of the Capital Goods Business Sector. The testing was performed between September 27, 1989 and August 23, 1990.

### 1.3 Conclusion

The AMPLIMITE HDF-20 Connector meets the electrical, mechanical, and environmental performance requirements of AMP Product Specification 108-40012, Rev. 0.

## 1.4 Product Description

The AMPLIMITE HDF-20 Low Profile (90° Cable Exit) is designed with non-removable insulation displacement contacts for mass termination of .050 centerline #26 & #28 AWG solid and stranded round conductor planar ribbon cable. Connector varieties include an all plastic version, as well as one with a front metal shell. The contacts are Phosphor Bronze, with .000030 gold over nickel on the mating ends and .000100 tin-lead over nickel in the termination area. The housings and covers are made of black Thermoplastic 94V-0 rated.

## 1.5 Test Samples

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

| Test Group | Quantity | Part Number | Description |
|---|---|---|---|
| 2,3,6 | 5 ea. | 747318-4 | Recp 9 pos. AWG 28 stranded |
| 5 | 5 ea. | 747319-4 | Recp 9 pos. AWG 28 stranded |
| 2 | 5 ea. | 747318-4 | Recp 9 pos. AWG 26 stranded |
| 2 | 5 ea. | 747318-4 | Recp 9 pos. AWG 26 solid |
| 7 | 5 ea. | 747318-4 | Recp 9 pos. |
| 7 | 5 ea. | 747303-4 | Recp 9 pos. |
| 2,3,6 | 5 ea. | 747321-4 | Plug 9 pos. AWG 28 stranded |
| 5 | 5 ea. | 747322-4 | Plug 9 pos. AWG 28 stranded |
| 2 | 5 ea. | 747321-4 | Plug 9 pos. AWG 26 stranded |
| 2 | 5 ea. | 747321-4 | Plug 9 pos. AWG 26 solid |
| 7 | 5 ea. | 747321-4 | Plug 9 pos. |
| 7 | 5 ea. | 747306-4 | Plug 9 pos. |
| 7 | 5 ea. | 747318-3 | Recp 15 pos. |
| 7 | 5 ea. | 747303-3 | Recp 15 pos. |
| 7 | 5 ea. | 747321-3 | Plug 15 pos. |
| 7 | 5 ea. | 747306-3 | Plug 15 pos. |
| 1 | 5 ea. | 747319-2 | Recp 25 pos. AWG 28 stranded |
| 1 | 5 ea. | 747319-2 | Recp 25 pos. AWG 26 stranded |
| 1 | 5 ea. | 747319-2 | Recp 25 pos. AWG 26 solid |
| 7 | 5 ea. | 747303-2 | Recp 25 pos. |
| 1 | 5 ea. | 747322-2 | Plug 25 pos. AWG 28 stranded |
| 1 | 5 ea. | 747322-2 | Plug 25 pos. AWG 26 stranded |
| 1 | 5 ea. | 747322-2 | Plug 25 pos. AWG 26 solid |
| 7 | 5 ea. | 747306-2 | Plug 25 pos. |
| 4 | 5 ea. | 747303-1 | Recp 37 pos. AWG 26 stranded |
| 7 | 5 ea. | 747318-1 | Recp 37 pos. |
| 7 | 5 ea. | 747303-1 | Recp 37 pos. |
| 4 | 5 ea. | 747306-1 | Plug 37 pos. AWG 26 stranded |
| 7 | 5 ea. | 747321-1 | Plug 37 pos. |
| 7 | 5 ea. | 747306-1 | Plug 37 pos. |

## 1.5 Test Samples (Cont'd.)

| Test Group | Quantity | Part Number | Description |
|---|---|---|---|
| 1 | 5 ea. | 111119-1 | Recp 50 pos. AWG 28 stranded |
| 1 | 5 ea. | 111119-1 | Recp 50 pos. AWG 26 stranded |
| 1 | 5 ea. | 111119-1 | Recp 50 pos. AWG 26 solid |
| 2,4,6 | 5 ea. | 746789-1 | Recp 50 pos. AWG 28 stranded |
| 2 | 5 ea. | 746789-1 | Recp 50 pos. AWG 26 stranded |
| 2 | 5 ea. | 746789-1 | Recp 50 pos. AWG 26 solid |
| 1 | 5 ea. | 111120-1 | Plug 50 pos. AWG 28 stranded |
| 1 | 5 ea. | 111120-1 | Plug 50 pos. AWG 26 stranded |
| 1 | 5 ea. | 111120-1 | Plug 50 pos. AWG 26 solid |
| 2 | 5 ea. | 746790-1 | Plug 50 pos. AWG 28 stranded |
| 2,4,6 | 5 ea. | 746790-1 | Plug 50 pos. AWG 26 stranded |
| 2 | 5 ea. | 746790-1 | Plug 50 pos. AWG 26 solid |

## 1.6 Qualification Test Sequence

| | Test Groups | | | | | | |
|---|---|---|---|---|---|---|---|
| Test or Examination | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Examination of Product | 1,9 | 1,6 | 1,6 | 1,5 | 1,8 | 1,8 | 1,6 |
| Termination Resistance, Dry Circuit | 3,7 | 2,5 | 2,5 | 2,4 | 2,4 | | |
| Dielectric Withstanding Voltage | | | | | | 3,7 | |
| Insulation Resistance | | | | | | 2,6 | |
| T-Rise vs. Current | | | | 3 | | | |
| Vibration | 5 | | | | | | |
| Physical Shock | 6 | | | | | | |
| Mating Force | 2 | | | | | | 2 |
| Unmating Force | 8 | | | | | | 3,5 |
| Durability | 4 | 3 | 3 | | | | 4 |
| Thermal Shock | | | | | | 4 | |
| Humidity-Temperature Cycling | | | 4 | | | 5 | |
| Industrial Mixed Flowing Gas | | | | | 3 | | |
| Temperature Life | | 4 | | | | | |

The numbers indicate sequence in which tests were 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 Capital Goods Business Sector.

### 2.2 Termination Resistance, Dry Circuit - Groups 1, 2, 3, 4, 5

All termination resistance measurements, taken at 100 milliamperes dc maximum and 50 millivolts open circuit voltage, were less than 25 milliohms.

| Test Group | No. of Samples | Condition | Min. | Max. | Mean |
|---|---|---|---|---|---|
| 1 | 1125 | Initial | 4.90 | 10.90 | 6.69 |
| | | After Mechanical | 5.40 | 22.10 | 7.49 |
| 2 | 885 | Initial | 5.40 | 11.00 | 7.14 |
| | | After Heat Age | 5.40 | 18.00 | 7.83 |
| 3 | 295 | Initial | 5.30 | 12.89 | 7.09 |
| | | After Humidity | 5.30 | 13.50 | 7.03 |
| 4 | 435 | Initial | 5.30 | 10.40 | 6.66 |
| | | After T-Rise | 5.20 | 10.40 | 6.49 |
| 5 | 45 | Initial | 6.02 | 13.11 | 7.92 |
| | | After Industrial Gas | 6.44 | 23.86 | 10.98 |

All values in milliohms

### 2.3 Dielectric Withstanding Voltage - Group 6

No dielectric breakdown or flashover occurred, when a test voltage of 500 vac was applied between adjacent contacts.

### 2.4 Insulation Resistance - Group 6

All insulation resistance measurements were greater than 5000 megohms.

### 2.5 Temperature Rise vs. Current - Group 4

All samples had a temperature rise of less than 30°C above ambient, when a specified current of 1.25 amperes dc was applied.

### 2.6 Vibration - Group 1

No discontinuities of the contacts were detected during vibration. Following vibration, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.7 Physical Shock - Group 1

No discontinuities of the contacts were detected during physical shock. Following physical shock testing, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.8 Mating Force - Groups 1, 7

All mating force measurements were less than the specification requirements. (Figure 1)

2.9 Unmating Force - Groups 1, 7

All unmating force measurements were within specification limits. (Figure 1)

| | Mating | | Unmating | |
|---|---|---|---|---|
| No. of Contacts | w/indent max. | wo/indent max. | w/indent max. | wo/indent min. |
| 9 | 30 | 4.5 | 30 | 0.5 |
| 15 | 33 | 7.5 | 33 | 0.9 |
| 25 | 37 | 12.5 | 37 | 1.5 |
| 37 | 40 | 18.5 | 40 | 2.5 |
| 50 | 45 | 25.0 | 45 | -- |

Mating and Unmating Force Limits (lbs)
Figure 1

2.10 Durability - Groups 1, 2, 3, 7

No physical damage occurred to the samples, as a result of mating and unmating the connector 100 times for .000015 gold and 500 times for .000030 gold.

2.11 Thermal Shock - Group 6

No evidence of physical damage to either the contacts or the connector was visible as a result of thermal shock.

2.12 Humidity-Temperature Cycling - Groups 3, 6

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to humidity-temperature cycling.

2.13 Industrial Mixed Flowing Gas - Group 5

No evidence of physical damage to either the contacts or the connector was visible, as a result of exposure to the pollutants of industrial mixed flowing gas.

2.14 Temperature Life - Group 2

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to an elevated temperature.

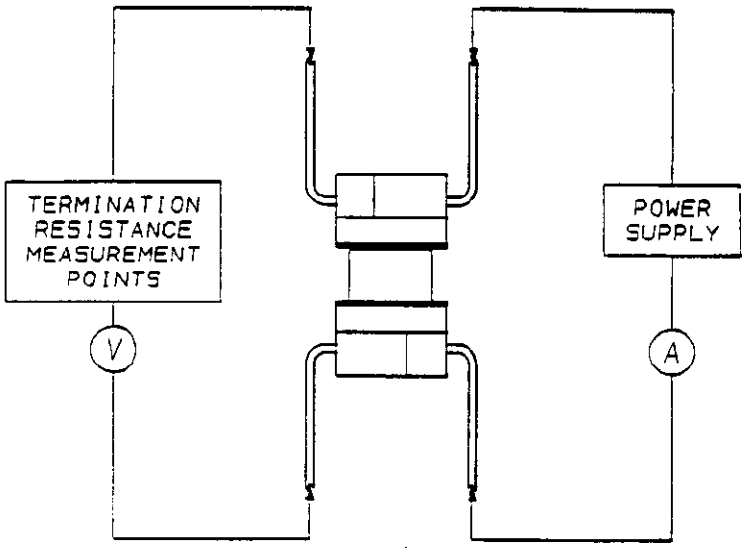
3. Test Methods

3.1 Examination of Product

Product drawings and inspection plans were used to examine the samples. They were examined visually and functionally.

3.2 Termination Resistance, Low Level

Termination resistance measurements at low level current were made, using a four terminal measuring technique (Figure 2). The test current was maintained at 10 milliamperes dc, with an open circuit voltage of 50 millivolts dc.




Typical Termination Resistance Measurement Points
Figure 2

### 3.3 Dielectric Withstanding Voltage

A test potential of 500 vac was applied between the adjacent contacts. This potential was applied for one minute and then returned to zero.

### 3.4 Insulation Resistance

Insulation resistance was measured between adjacent contacts, using a test voltage of 500 volts dc. This voltage was applied for two minutes before the resistance was measured.

### 3.5 Temperature Rise vs. Specified Current

Connector temperature was measured, while energized at the specified current of 1.25 amperes dc. Thermocouples were attached to the connectors to measure their temperatures. This temperature was then subtracted from the ambient temperature to find the temperature rise. When three readings at five minute intervals were the same, the readings were recorded.

### 3.6 Vibration, Random

Mated connectors were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 50 and 2000 hertz. The power spectral density at 50 hz is 0.05 $G^2/Hz$. The spectrum slopes up at 6 dB per octave to a PSD of .2 $G^2/Hz$ at 100 Hz. The spectrum is flat at .2 $G^2/Hz$ from 100 to 1000 Hz. The spectrum slopes down at 6 dB per octave to the upper bound frequency of 2000 Hz, at which the PSD is 0.05 $G^2/Hz$. The root-mean square amplitude of the excitation was 16.91 GRMS.

### 3.7 Physical Shock

Mated connectors were subjected to a physical shock test, having a half-sine waveform of 50 gravity units (g peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the three mutually perpendicular planes, for a total of 18 shocks. The connectors were monitored for discontinuities greater than one microsecond, using a current of 100 milliamperes in the monitoring circuit.

### 3.8 Mating Force

The force required to mate individual connectors was measured, using a free floating fixture with the rate of travel at 0.5 inch/minute.

### 3.9 Unmating Force

The force required to unmate individual connectors was measured, using a free floating fixture with the rate of travel at 0.5 inch/minute.

### 3.10 Durability

Connectors were mated and unmated at a rate not exceeding 200 cycles per hour.

### 3.11 Thermal Shock

Mated connectors were subjected to five cycles of temperature extremes, with each cycle consisting of 30 minutes at each temperature. The temperature extremes were -55°C and 105°C. The transition between temperatures was less than one minute.

### 3.12 Humidity-Temperature Cycling

Mated connectors were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25°C and 65°C twice, while the relative humidity was held at 95%. During five of the first nine cycles, the connectors were exposed to a cold shock at -10°C for 3 hours.

### 3.13 Industrial Mixed Flowing Gas, Class III

Mated connectors were exposed for 20 days to an industrial mixed flowing gas Class III exposure. Class III exposure is defined as a temperature of 30°C and a relative humidity of 75%, with the pollutants of $Cl_2$ at 20 ppb, $NO_2$ at 200 ppb, and $H_2S$ at 100 ppb.

### 3.14 Temperature Life

Mated samples were exposed to a temperature of 105°C for 500 hours.

4. **Validation**

Prepared by:

Terrance M. Shingara 8/31/90
Terrance M. Shingara
Test Engineer
Design Assurance Testing
Corporate Test Laboratory

Reviewed by:

Richard A. Groft 8/31/90
Richard A. Groft
Supervisor
Design Assurance Testing
Corporate Test Laboratory

Approved by:

Edward L. Gill 9/5/90
Edward Gill
Manager
Engineering & Design Assurance
Capital Goods Business Sector