
USB Four Port Hub

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the AMP* Four Port Universal Serial Bus (USB) Hub used for connecting peripherals to a USB enabled personal computer.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

1.3. Qualification Test Results

Successful qualification testing on the subject product line was completed on 14Sep98. The Qualification Test Report number for this testing is 501-445. This documentation is on file at and available from Global Engineering and Manufacturing Standards (GEMS).

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. AMP Documents

- A. 109-1: General Requirements for Test Specifications
- B. 109 Series: Test Specifications as indicated in Figure 1
- C. Corporate Bulletin 401-76: Cross-reference between AMP Test Specifications and Government or Commercial Documents
- D. 408-4461: Instruction Sheet
- E. 501-445: Qualification Test Report

2.2. Commercial Standards

- A. EMC 89/336/EEC as amended by 92/31/EEC and 93/68/EEC
- B. FCC CFR 47 Part 15 Class B, EN 55022 Class B (EMI)
- C. ICES-003 Class B Digital Apparatus
- D. USB Specification Rev 1.0
- E. UL 1950, CSA 950, EN 60950
- F. VCCI V-0/92.10 Conducted and Radiated Emissions, Class 2

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

3.3. Ratings

- A. Voltage: Self powered by 6 vdc at 3 amperes regulated supply. See Note.
- B. Current:
 - (1) 500 milliamperes maximum per port, sel-powered mode
 - (2) 100 milliamperes per port BUS powered by host PC
- C. Temperature:
 - (1) Operating: 0 to 40°C
 - (2) Storage: -40 to 70°C
- D. Humidity: 5 to 90% RH non-condensing at 25°C

NOTE *The maximum external DC voltage that can be applied to the hub is 8.0 vdc at a downstream load of 2.0 amperes at 40°C. The minimum DC voltage that can be applied to the hub not counting ripple is 5.28 vdc at a downstream load of 2 amperes at 40°C. If an unregulated supply is used, ripple must be considered. In addition, the specs from an AC adapter are only valid at nominal AC voltage of 120 volts.*

3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1. Unless otherwise specified, all tests shall be performed at ambient environmental conditions per AMP Specification 109-1.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Examination of product.	Meets requirements of product drawing and AMP Spec 408-4461.	Visual, dimensional and functional per applicable quality inspection plan.
ELECTRICAL		
Functional test, Computer Access Technology Corporation™ (CATC).	Samples shall meet all requirements.	See Para 5.
MECHANICAL		
Vibration, random.	No discontinuities of 1 microsecond or longer duration. See Note.	AMP Spec 109-21-7. Subject unpowered samples to 3.13 G's rms between 5-500 Hz. 15 minutes in each of 3 mutually perpendicular planes. See Figure 3.
Mechanical shock, specified pulse.	No discontinuities of 1 microsecond or longer duration. See Note.	AMP Spec 109-26-1, except 30 G's. Subject unpowered samples to 30 G's half-sine shock pulses of 11 milliseconds duration. 3 shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks. See Figure 3.

Figure 1 (cont)

Test Description	Requirement	Procedure
Drop.	See Note.	Drop unpowered samples from a height of 3 feet onto a concrete surface.
ENVIRONMENTAL		
Thermal shock.	See Note.	AMP Spec 109-22. Subject unpowered samples to 5 cycles between -40 and 70°C.
Humidity-temperature cycling.	See Note.	AMP Spec 109-23-3, Condition B. Subject powered samples to 10, 24 hour cycles between 25 and 65°C at 95% RH.
Temperature life.	See Note.	AMP Spec 109-43. Subject powered samples to temperature life at 40°C for 500 hours.

NOTE *Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 2.*

Figure 1 (end)

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)		
	1	2	3
	Test Sequence (b)		
Examination of product	1,7	1,5	1,6
Functional test	2,6	2,4	2,5
Vibration	3		
Mechanical shock	4		
Drop	5		
Thermal shock			3
Humidity-temperature cycling			4
Temperature life		3	

NOTE (a) *See Para 4.1.A.*
 (b) *Numbers indicate sequence in which tests are performed.*

Figure 2

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Sample Selection

Samples shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. All test groups shall each consist of a minimum of 3 samples. Follow handling instructions per AMP Instruction Sheet 408-4461 and return samples to static proof bags when not in use.

B. Test Sequence

Qualification inspection shall be verified by testing samples as specified in Figure 2.

4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality Conformance Inspection

The applicable AMP quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

5. FUNCTIONAL TEST

This test shall be performed using a CATC tester with built-in diagnostics and a USB enabled PC. Since not all PC's shipped with USB ports have the USB ports enabled, it may require a CMOS setup during booting to enable them.

5.1. Test Summary

A hub test program is included with the CATC tester that must be executed from DOS. The Windows 95 DOS window cannot be used for this purpose. The 3 files contained on the CATC disk shall be copied to a separate PC subdirectory. The test program will create files documenting the test results for each day.

5.2. Opening the Required DOS Window

There are 2 methods for opening the required DOS window.

A. Method 1, PC off.

- (1) Start the PC.
- (2) Press the **F8** key as soon as Windows begins to load.
- (3) Select the **Command Prompt Only** option.

- B. Method 2, in Windows 95.
- (1) Select **START** button from Task Bar at lower left.
 - (2) Select **Shut Down** menu item.
 - (3) Select **Restart in MS-DOS Mode** checkbox.
 - (4) Select **OK** button.

5.3. Test and Sample Setup

The CATC tester has its own power cube. The USB Hub is connected using 5 USB cables and the 6 vdc at 3 amperes AC adapter. One USB cable connects from the upstream port on the USB port on the PC. Each downstream port (1-4) of the USB Hub is connected to the associated port (1-4) of the CATC tester. From the subdirectory containing the CATC software, execute the **USB_UHT.EXE** program. The results will be output in a table format similar to the following:

```

Found Hub with Vendor_ID 451, Product_ID 1446
DATA Connect/   Power Remote   Over-
Disconnect      Wakeup          Current
FullSpeed Port 1   OK   OK       OK   OK       ****
LowSpeed Port 1   OK   OK       OK   OK       ****
FullSpeed Port 3   OK   OK       OK   OK       ****
LowSpeed Port 3   OK   OK       OK   OK       ****
FullSpeed Port 2   OK   OK       OK   OK       ****
LowSpeed Port 2   OK   OK       OK   OK       ****
FullSpeed Port 4   OK   OK       OK   OK       ****
LowSpeed Port 4   OK   OK       OK   OK       ****

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Didn't trip on 650 ma
Test FAILED

NOTE

It is expected the USB Hub will fail the CATC test for Over-Current since it will not shut down at the threshold value of 650 milliamperes that the CATC has established. This is not a problem.