

PCI Connector Contact Finish ECN



PCI-SIG ENGINEERING CHANGE NOTICE

TITLE:	PCI/PCI-X Connector Contact Finish Changes
DATE:	January 7, 2003 (first submitted, and subsequently improved)
AFFECTED DOCUMENT:	PCI revision 2.3 and PCI revision 3.0 (retroactive to versions 2.1 and 2.2)
SPONSOR:	Roger Tiple; Hewlett-Packard Company

Part I

1. Summary of the Functional Changes

The intent of this ECR is to update the PCI base specifications to include PCI connector metallurgical practices which have been commonly accepted or introduced since the original wording was drafted before the PCI 2.0 specification. With an overwhelming majority of PCI and PCI-X connectors shipped in the world that do not meet the PCI specification for contact finish plating, the most efficient way to rectify the situation is to correct the specification.

The sections and changes are identical for both the PCI version 2.3 and PCI version 3.0 specifications, and are to be retroactive to PCI Specification versions 2.1 and 2.2.

1. In section 5.4, you have to change table 5-1 to add two other commonly used connector contact finishes.
 - a. Add 15 microinches of gold over 50 microinches of nickel, to cover common desktop and low-end server implementations.
 - b. Add a category that covers consumer-quality metallurgical alloys that include a wide range of choices.
2. In section 5.5, the durability specification has to change so that these two new connector contact finishes are paired with a smaller number of mating cycles. H-P research shows that connector finish 3 is reliable to 15 mating cycles, so the recommended specification change is to make that durability specification ten mating cycles. To accommodate the consumer-grade PCI connectors, the minimum durability of contact finish 4 should be two mating cycles.
3. In section 5.5, to accommodate research that shows that increased connector porosity of contact finishes 3 and 4 may cause a reduction in the mating cycles over time, due to increased corrosion in the specified test environment. So the concept of derating the durability of these two contact finishes is introduced. The suggestion is to define a half-life of one year for the durability specification of contact finishes 3 and 4, meaning that every year beyond shipment, the number of reliable mating cycles will be reduced by half.

2. Benefits as a Result of the Changes

PCI-SIG member companies will be able to ship more products that meet the PCI specification.

3. Assessment of the Impact

No impact, other than to improve member claims that they ship PCI compatible products.

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4. Analysis of the Hardware Implications

Only change would be for quality assurance testing of incoming parts.

5. Analysis of the Software Implications

Absolutely none.

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Part II

Detailed Description of the change

The original Table 5-1, directly below, as it is published in PCI version 2.1, 2.2 and 2.3, discusses the required connector finish. It has been the same ever since PCI version 2.0 and before that in the Add-in Card and Connector Addendum to PCI Version 1.0.

5.4. Connector Physical Requirements

Table 5-1: Connector Physical Requirements

Part	Materials
Connector Housing	High-temperature thermoplastic, UL flammability rating 94V-0, color: white.
Contacts	Phosphor bronze.
Contact Finish 	0.000030 inch minimum gold over 0.000050 inch minimum nickel in the contact area. Alternate finish: gold flash over 0.000040 inch (1 micron) minimum palladium or palladium-nickel over nickel in the contact area.

This ECN replaces Table 5-1 (above) in PCI versions 2.1, 2.2 and 2.3 with the following new Table 5-1:

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Table 5-1: Connector Physical Requirements


Part	Materials
Connector Housing	High-temperature thermoplastic, UL flammability rating 94V-0, color: white.
Contacts	Phosphor bronze.
<p><u>Acceptable Contact Finishes:</u>  (see Table 5-2 for durability expectations for each finish)</p>	<p>0.000030 inch minimum gold over 0.000050 inch minimum nickel in the contact area. Alternate finish: gold flash over 0.000040 inch (1 micron) minimum palladium or palladium-nickel over nickel in the contact area.</p> <ol style="list-style-type: none"> 1. <u>0.000030 inch minimum gold over 0.000050 inch minimum nickel in the contact area.</u> 2. <u>Gold flash over 0.000040 inch (1 micron) minimum palladium or palladium-nickel over nickel in the contact area.</u> 3. <u>0.000015 inch minimum gold over 0.000050 in nickel in the contact area.</u> 4. <u>Other gold, nickel and/or palladium alloys over 0.000030 inch minimum nickel in the contact area.</u>

Table 5-2 in PCI versions 2.1, 2.2 and 2.3 must also change, since it defines the durability requirements. Finishes 3 and 4 are less durable than finishes 1 and 2.

5.5. Connector Performance Specification

Table 5-2: Connector Mechanical Performance Requirements

Parameter	Specification
Durability	100 mating cycles without physical damage or exceeding low level contact resistance requirement when mated with the recommended add-in card edge.
Mating Force	6 oz. (1.7 N) max. avg. per opposing contact pair using MIL-STD-1344, Method 2013.1 and gauge per MIL-C-21097 with profile as shown in add-in card specification.
Contact Normal Force	75 grams minimum.

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PCI versions 2.1, 2.2 and 2.3 Table 5-2 above will be replaced with the following new Table 5-2:

Table 5-2: Connector Mechanical Performance Requirements


Parameter	Specification
Durability	<p>100 mating cycles without physical damage or exceeding low level contact resistance requirement when mated with the recommended add-in card edge.</p> <p><u>The minimum mating cycles defined below to be without physical damage or exceeding the low level contact resistance requirement when mated with the recommended add-in card edge. Refer to Acceptable Contact Finishes defined in Table 5-1:</u></p> <p><u>Contact Finish 1: 100 mating cycles.</u></p> <p><u>Contact Finish 2: 100 mating cycles.</u></p> <p><u>Contact Finish 3: 10 mating cycles.</u></p> <p><u>Contact Finish 4: 2 mating cycles.</u></p>
<u>Durability De-rating</u>	<p><u>Refer to Acceptable Contact Finishes defined in Table 5-1:</u></p> <p><u>Contact finishes 1 and 2 will have no Durability de-rating.</u></p> <p><u>Contact finishes 3 and 4 will have a Durability half-life of one year, when left un-mated and these contact platings may not survive field exposure for 5 years or longer.</u></p>
Mating Force	6 oz. (1.7N) maximum average per opposing contact pair using MIL-STD-1344, Method 2013.1 and gauge per MIL-C-21097 with profile as shown in add-in card specification.
Contact Normal Force	75 grams minimum.

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Table 5-1, directly below, as it is published in PCI version 3.0, includes the required connector finish, and it is very similar to PCI version 2.3 and previous versions.


5.4. Connector Physical Requirements

Table 5-1: Connector Physical Requirements

Part	Materials
Connector Housing	High-temperature thermoplastic, UL flammability rating 94V-0, color: white.
Contacts	Phosphor bronze.
Contact Finish 	0.000030 inch minimum gold over 0.000050 inch minimum nickel in the contact area. Alternate finish: gold flash over 0.000040 inch (1 micron) minimum palladium or palladium-nickel over nickel in the contact area.

This ECN replaces Table 5-1 in PCI version 3.0 with the following new Table 5-1:

Table 5-1: Connector Physical Requirements

Part	Materials
Connector Housing	High-temperature thermoplastic, UL flammability rating 94V-0, color: white.
Contacts	Phosphor bronze.
<u>Acceptable Contact Finish</u> es:  (see Table 5-2 for durability expectations for each finish)	0.000030 inch minimum gold over 0.000050 inch minimum nickel in the contact area. Alternate finish: gold flash over 0.000040 inch (1 micron) minimum palladium or palladium-nickel over nickel in the contact area. 5. <u>0.000030 inch minimum gold over 0.000050 inch minimum nickel in the contact area.</u> 6. <u>Gold flash over 0.000040 inch (1 micron) minimum palladium or palladium-nickel over nickel in the contact area.</u> 7. <u>0.000015 inch minimum gold over 0.000050 in nickel in the contact area.</u> 8. <u>Other gold, nickel and/or palladium alloys over 0.000030 inch minimum nickel in the contact area.</u>

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To complete the ECN, PCI version 3.0 Table 5-2 must also change, since it defines the durability requirements. Finishes 3 and 4 are less durable than finishes 1 and 2.

5.5. Connector Performance Specification

Table 5-2: Connector Mechanical Performance Requirements

Parameter	Specification
Durability	100 mating cycles without physical damage or exceeding low level contact resistance requirement when mated with the recommended add-in card edge.
Mating Force	6 oz. (1.7 N) max. avg. per opposing contact pair using MIL-STD-1344, Method 2013.1 and gauge per MIL-C-21097 with profile as shown in add-in card specification.
Contact Normal Force	75 grams minimum.

PCI Version 3.0 Table 5-2 above will be replaced with the following new Table 5-2:

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Table 5-2: Connector Mechanical Performance Requirements

Parameter	Specification
Durability	<p>100 mating cycles without physical damage or exceeding low level contact resistance requirement when mated with the recommended add-in card edge.</p> <p><u>The minimum mating cycles defined below to be without physical damage or exceeding the low level contact resistance requirement when mated with the recommended add-in card edge. Refer to Acceptable Contact Finishes defined in Table 5-1:</u></p> <p><u>Contact Finish 1: 100 mating cycles.</u></p> <p><u>Contact Finish 2: 100 mating cycles.</u></p> <p><u>Contact Finish 3: 10 mating cycles.</u></p> <p><u>Contact Finish 4: 2 mating cycles.</u></p>
<u>Durability De-rating</u>	<p><u>Refer to Acceptable Contact Finishes defined in Table 5-1:</u></p> <p><u>Contact finishes 1 and 2 will have no Durability de-rating.</u></p> <p><u>Contact finishes 3 and 4 will have a Durability half-life of one year, when left un-mated and these contact platings may not survive field exposure for 5 years or longer.</u></p>
Mating Force	6 oz. (1.7N) maximum average per opposing contact pair using MIL-STD-1344, Method 2013.1 and gauge per MIL-C-21097 with profile as shown in add-in card specification.
Contact Normal Force	75 grams minimum.