VESA®

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VESA Enhanced Video Connector (P&D-A) (formerly EVC) Physical Connector Standard

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Purpose:
To establish a standard video output connector physical description for the VESA Enhanced Video Connector (P&D-A). The physical description will include general dimensions, material designations, and performance parameters, as well as suggested test methodology for reliability and conformance testing.

Summary:
To date, the computer display industry has relied on several different video output connector schemes, none of which adequately address the need for a small, low-cost system providing support for a number of different signals relating to the human interface system. This document establishes physical standards for a connector in order to address these needs and provide superior performance over what was possible with earlier systems.

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Scope and Purpose

The VESA Enhanced Video Connector standard is intended to provide a new standard for the host/display interface for personal computers, workstations, and similar applications. The goal of this standard is a next-generation display interface providing improved video performance, support for a large range of additional features, and a reduction in the overall system cost and complexity. This specification covers interconnect systems typically used for computer monitors and integrated multimedia functions. The contacts are separated into two different groups in order to tailor the performance of the connector for the different applications. One set of contacts, on 1.905 X 1.905 mm contact spacing, is designed to handle the anticipated range of power, ground, digital, and low frequency analog signals. The other set, the shielded contacts, is designed for high frequency analog signals at 75 ohms. The receptacle, card-side connector, is defined as a shielded housing with helical pins and shielded contacts that are soldered to a printed circuit board. Connector polarization is achieved by the "D"-shaped housing configuration. The specification is given according to the following:

1) Size: 30 general purpose circuits, 4 shielded circuits
2) Shielded housings only
3) Type of solder tail
4) Suggested solder pad layout
5) Housing plug and receptacle maximum dimensions
6) Plating

Normative References

VESA Enhanced Video Connector	Signal Standards
MIL-T-10727B	Tin Plating
MIL-G-45204B	Gold Plating
MIL-P-81728A	Tin-Lead Plating
MIL-STD-202	Solderability
ASTM B 488	Electrodeposited Gold
ASTM B 545	Electrodeposited Tin
ASTM B 579	Electrodeposited Tin-Lead Alloy
QQN-290	Nickel Plating
ASME Y14.5-1994	Dimensioning & Tolerancing
ANSI/EIA 364	Electrical Connector/Socket Test Procedures (Including Environmental Classifications)

Intellectual Property

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The connectors specified by this standard for the video output connector and the related cable connector are covered by one or more patents held by Molex Incorporated. Molex has provided VESA with a statement regarding their licensing policies for these designs, in keeping with the established VESA policy

regarding the use of patented technology in VESA standards. A copy of this statement is available from the VESA office.

Support

Clarifications and application notes to support this standard may be written. To obtain the latest standard and any support documentation, contact VESA.

If you have a product which incorporates P&D-A Physical Connector, you should ask the company that manufactured your product for assistance. If you are a manufacturer, VESA can assist you with any clarification you may require. All comments or reported errors should be submitted in writing to VESA using one of the following methods.

- Fax (408) 435-8225, *direct this note to Technical Support at VESA*
- e-mail support@vesa.org
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1. Connectors

1.1 General

In a typical application, a receptacle board connector will present a receptacle for connection, via cable, to a host or peripheral interface. The cable assemblies may have plug connectors on each end depending on the user application.

Within this standard, general dimensions and tolerances, and descriptions of those features which affect the intermateability of the plug and socket, are described. The P&D-A connector mating interface is covered by patents issued to Molex, Inc. To obtain license to these patents and to obtain additional connector interface design detail, companies should contact Molex directly at: Molex Inc., Data/Comm Division, 2222 Wellington Court, Lisle, IL 60532. This information, along with the information in this standard, will provide sufficient data for companies to build plug compatible products to, and in support of, the P&D-A standard. Similarly, a reference hole pattern (footprint) for the attachment of the receptacle to the printed circuit board (PCB), is described in Figure 1.4.

All other features which do not affect the intermateability are not described, and may vary. They are only controlled by the performance requirements, which are described in Section 2.0.

Figures 1.1 and 1.2 describe the outer metal shell, which acts as a protective shield to prevent mechanical damage, to provide electrostatic protection, and to maintain shield continuity and integrity.

1.1.1 Positive Retention

Jackscrews with 4-40 threads are used to retain the plug and receptacle together and also to ensure that the plug and receptacle reference surfaces always bottom against each other during mating, thus providing an effective seal for EMI/RFI purposes.

1.1.2 Contact Finish On Plug And Receptacle Contacts

It is necessary to standardize the electroplated finish on the contacts to assure the performance and compatibility of the mating interfaces of the plugs and receptacles from different sources. The following standardized electroplatings are most common, but other thicknesses and compositions can be used as long as they meet the criteria specified in *"Normative References*".

a) 0.76 micro-meters minimum gold, over 1.27 micro-meters nickel.
b) 0.25 micro-meters minimum gold over 0.76 micro-meters.
palladium-nickel alloy *80% Pd-20% Ni, over 1.27 micro-meters nickel.
*Note: It is not acceptable to use tin, tin/lead, nickel or other non-noble materials known to be incompatible with gold or other essentially noble interfaces.

1.1.3 Termination Finish On Plug And Receptacle Terminals

It is acceptable to use an electroplate of tin-lead with a minimum thickness of 3.04 micro-meters, over 1.27 micro-meters minimum nickel.

1.1.4 Shell Finish On Plugs And Receptacles

It is necessary to standardize the plated finish on the shells to insure compatibility of products from different sources. Both shells shall be electroplated with a minimum of 3.03 micro-meters of tin or tin alloy over a suitable underplate.

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1.1.5 Connector Durability

The requirements of different end-use applications call for connectors which can be mated and unmated a different number of times, without degrading performance beyond acceptable limits. Accordingly, this standard establishes a minimum performance criteria of 500 mating cycles while meeting the performance criteria as specified in Performance Groups D and F in Section 3.1.

1.2 Plug Connector

The mating features of the connector plug are described in Figure 1.1. This information, in addition to the mating information provided in the license, will assure the intermateability of the plug with standardized receptacles. The plug is defined as the connector with the exposed male contacts.

1.2.1 Plug Connector Terminations

The termination of the wire to the plug contacts may be varied to suit the manufacturing process needs of the cable assembler while meeting the requirements of Section 3. For reference, the following methods are listed: crimp, insulation displacement (IDC), insulation piercing, welding, and soldering.

1.3 Receptacle Connector

The mating features of the connector receptacle are described in Figure 1.2. This information, in addition to the mating information provided in the license, will assure the intermateability of the receptacle with standardized plugs. The receptacle is defined as the connector with the fully shrouded redundant female contacts.

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Figure 1.1 - Plug Mating Features

Notes:
1. Dimensions are in mm.
2. Interpret dimensions & tolerances per ASME Y14.5M - 1994.
3. Illustrations are in third angle projection.
4. Not to scale.

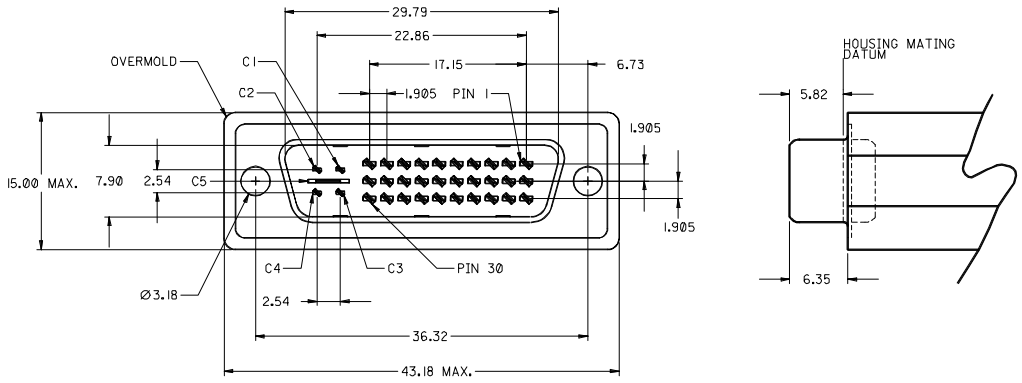

Figure 1.2 - Receptacle Mating Features

Notes:
1. Dimensions are in mm.
2. Interpret dimensions & tolerances per ASME Y14.5M - 1994.
3. Illustrations are in third angle projection.
4. Not to scale

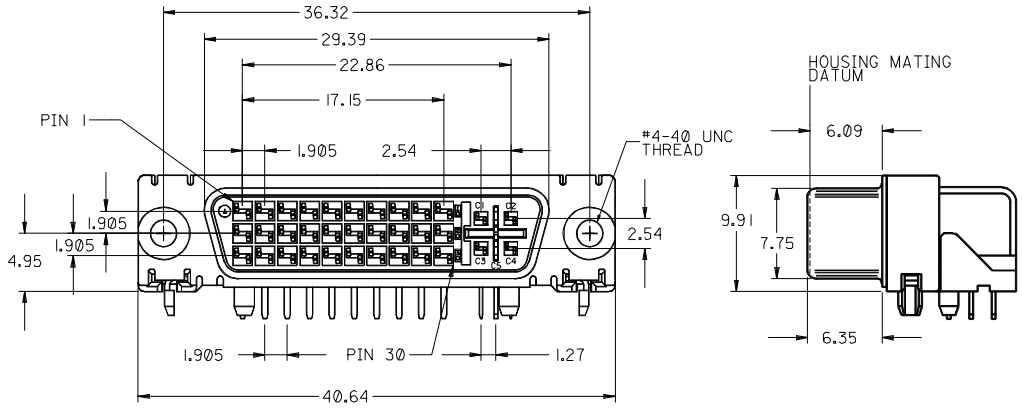

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Figure 1.3 - Recommended Panel Cut-out

Notes:
1. Dimensions are in mm.
2. Interpret dimensions & tolerances per ASME Y14.5M - 1994.
3. Not to scale.

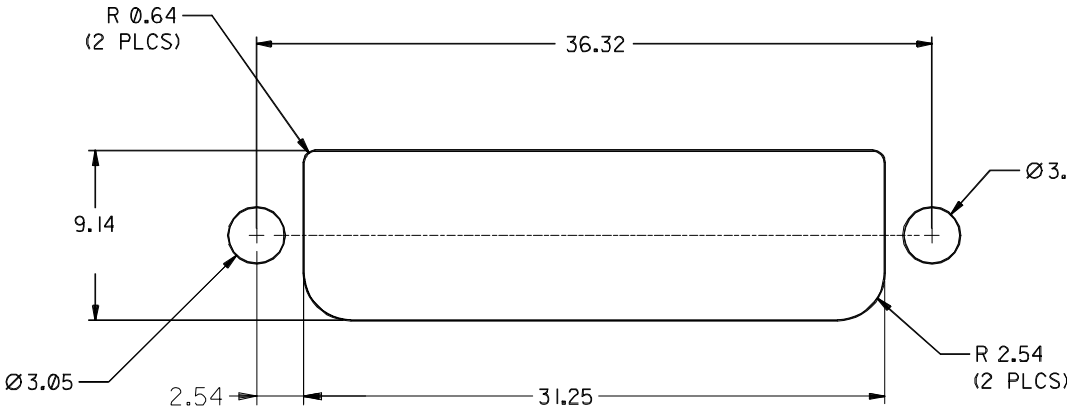
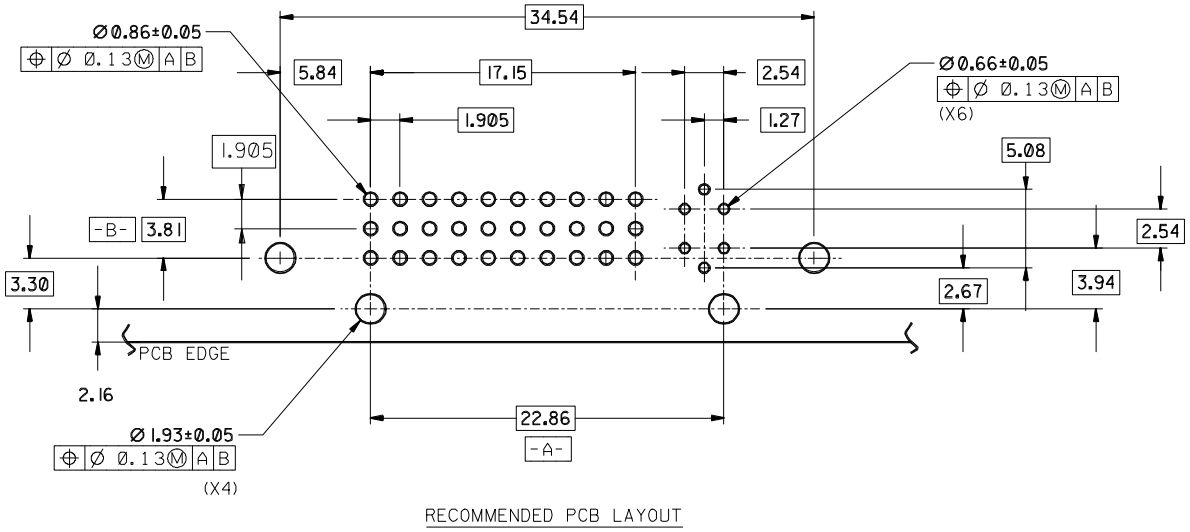


Figure 1.4 - Reference Hole Pattern (Receptacle)

Notes:
1. Dimensions are in mm.
2. Interpret dimensions & tolerances per ASME Y14.5M - 1994.
3. Not to scale.



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1.4 Pinouts

The signals supported by the P&D-A will be provided on the connector as follows:

Analog Video
Pixel Clock
Stereo Audio (analog)
Horizontal and Vertical Sync (TTL)
Battery Charge Power
Y/C Video
High-Speed Digital Interface
Display Data Channel

1.4.1 General Pin Assignments

The specific pin assignments are found in the VESA P&D-A Connector Pinout and Signal Standard. The listing below describes pins and their location per figures 1.1 and 1.2. Designers should refer to the VESA Enhanced Video Connector Pinout & Signal Standards for further information.

Pin	Function	Pin	Function
1	General Purpose, First Make	18	General Purpose, Last Make (Optional)
2	General Purpose, First Make	19	General Purpose, First Make
3	General Purpose, First Make	20	General Purpose, First Make
4	General Purpose, First Make	21	General Purpose, First Make
5	General Purpose, First Make	22	General Purpose, First Make
6	General Purpose, First Make	23	General Purpose, First Make
7	General Purpose, First Make	24	General Purpose, First Make
8	General Purpose, Last Make	25	General Purpose, First Make
9	General Purpose, First Make	26	General Purpose, First Make
10	General Purpose, First Make	27	General Purpose, First Make
11	General Purpose, First Make	28	General Purpose, Last Make
12	General Purpose, First Make	29	General Purpose, First Make
13	General Purpose, First Make	30	General Purpose, First Make
14	General Purpose, First Make	C1	Quasi-Coaxial, Last Make
15	General Purpose, First Make	C2	Quasi-Coaxial, Last Make
16	General Purpose, First Make	C3	Quasi-Coaxial, Last Make
17	General Purpose, First Make	C4	Quasi-Coaxial, Last Make
		C5	Common Ground for Quasi-Coaxial Lines, First Make

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2.0 Performance Characteristics

This section summarizes the environmental, electrical, and mechanical performance characteristics of the P&D-A connector. ANSI/EIA-364 Test Procedures and Conditions, or requirements are noted where applicable. Details of the connector performance test criteria and groups with test sequences may be found in Section 3.

2.1 Environmental

2.1.1 Thermal Shock

Conditions: ANSI/EIA-364-32, Condition 1
10 Cycles, mated/unmated

2.1.2 Cyclic Humidity

Conditions: ANSI/EIA-364-31, Condition A, C
Method III, omit 7A and 7B

2.1.3 Temperature Life

Conditions: ANSI/EIA-364-17, Condition 4
105^{o}C for 250 hours
Method A, mated

2.1.4 Corrosion Resistance

Conditions: ANSI/EIA-364-65, EnvironmentalClass II
Locate the sample in zone 14

2.2 Electrical

2.2.1 Contact Resistance

Conditions: ANSI/EIA-364-23
15 mΩ, maximum, initial per contact mated pair
10 mΩ, maximum change from original per contact mated pair

2.2.2. Dielectric Withstanding Voltage

Conditions: ANSI/EIA-364-20
Test voltage 500 VDC +/- 50 V
Method C, unmated and unmounted
Barometric pressure of 15psi

2.2.3 Insulation Resistance

Conditions: ANSI/EIA-364-21
Test voltage 500 VDC +/- 50 V
Method C, unmated and unmounted

2.2.4 Shell-to-Shell and Shell-to-Bulkhead Resistance

Conditions: Appendix A, Section 5.2
50 mΩ, maximum, initial
50 mΩ, maximum change from original

2.2.5 Contact Current Rating:

Conditions: ANSI/EIA-364-70, TP-70
55^{o} C, maximum ambient

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30^{o} C, maximum temperature change
1.5 A minimum

2.2.6 Impedance: General Purpose Lines

Conditions: ANSI/EIA-364-67[1]
TDR method normalized to 1ns risetime, single ended
1:1 S:G ratio
55Ω to 75Ω

2.2.7 Impedance: Differential Lines

Conditions: ANSI/EIA-364-67
TDR method normalized to 500ps risetime
Shell only grounded
Z_{source} & Z_{load} = 105Ω
105Ω +/- 10%

2.2.8 Impedance: Quasi-Coaxial Lines

Conditions: ANSI/EIA-364-67[1]
TDR method normalized to 1ns risetime
75Ω +/- 10%

2.2.9 Bandwidth: General Purpose Lines - Single Ended

Conditions: See Appendix A, Section 5.1
1:1 S:G ratio
0.8 GHz minimum

2.2.10 Bandwidth: General Purpose Lines - Differential

Conditions: See Appendix A, Section 5.1
1:1 S:G ratio
2.4 GHz minimum

2.2.11 Bandwidth: Quasi-Coaxial Lines

Conditions: See Appendix A, Section 5.1
2.4 GHz minimum

2.2.12 Crosstalk: General Purpose - Differential

Conditions: ANSI/EIA -364-90[1]
1 V/500 ps, Measure NEXT & FEXT
Shield only grounded
5% maximum

2.2.13 Crosstalk: Quasi-Coaxial Lines

Conditions: ANSI/EIA-364-90[1]
1 V/1 ns, Measure NEXT & FEXT
5% maximum

[1] At the time of preparation of this standard, ANSI/EIA-364-67 and ANSI/EIA-364-90 have not been ratified
and are cited as the recommended test procedures. The impedance values are described in ohms as calculated from the "% reflection" as specified in ANSI/EIA-364-67.

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2.3 Mechanical

2.3.1 Vibration

Conditions: ANSI/EIA-364-28, Method 5A, 15 min./axis

2.3.2 Mechanical Shock

Conditions: ANSI/EIA-364-27 Condition A

2.3.3 Durability

Conditions: ANSI/EIA-364-09
2 mated pairs, 5 cycles
2 mated pairs, Automatic cycling to 500 cycles
Rate: 500 +/- 50 cycles/hour

2.3.4 Mating and Unmating Forces

Conditions: ANSI/EIA-364-13
Insert and extract at speed of 25 mm/min
Unmating force: 1 kgf minimum, 4 kgf maximum

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3. Connector Performance Test Criteria

To verify the performance requirements, performance testing is specified according to the recommendations, test sequences and test procedures of ANSI/EIA-364, entitled “Electrical Connector Test Procedures Including Environmental Classifications”. Table 1 of ANSI/EIA-364 shows operating class definitions for different end-use applications. For the VESA P&D connector, the test specifications follow the recommendations for environmental class 1.3, which is defined as follows: “ No air conditioning of humidity control with normal heating and ventilation”.

The equipment operating environmental conditions shown, for class 1.3 in Table 2 are:

- Temperature: +15° C to +85° C
- Humidity: 95% maximum.

Class 1.3 is further described as operating in a “harsh environmental” state, but with no marine atmosphere.

Accordingly, the performance groupings, sequences within each group, and the test procedures will follow the recommendations of ANSI/EIA-364, except where the unique requirements of the P&D connector and cable assembly may call for tests which are not covered in ANSI/EIA-364, or where the requirements deviate substantially from those in that document. In those cases, test procedures of other recognized authorities or specific procedures described in the annexes will be cited.

Receptacles, plugs, and cable terminations shall perform to the requirements and pass all the following tests in the groups and sequences shown.

Testing may be done as follows:

a) Plug and receptacle only.
In this case, for those performance groups that require it, the plugs may be assembled to the cable to provide a cable assembly.

b) Cable assembly (with a plug on each end) and receptacle.
In this case, performance testing for both elements may be combined.

c) Cable assembly only (with a plug on each end).
In this case, the cable assembly supplier should use a plug connector source which has successfully passed performance testing, according to this standard.

d) Plug only, or receptacle only.
In this case, the other half shall be procured from a source, which has successfully passed performance testing, according to this standard. For those performance groups that require it, the plugs may be assembled to the cable to provide a cable assembly.

All resistance values shown in the following performance groups are for connectors only, including their terminations to the wire and/or PC board, but excluding the resistance of the wire. Resistance measurements shall be performed in an environment of temperature, pressure, and humidity specified by ANSI/EIA-364.

The numbers of units to be tested is a recommended minimum; the actual sample size is to be determined by requirements of users.

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3.1 Connector Performance Test Groups

3.1.1 Performance group A: Basic mechanical and dimensional conformance & electrical functionality when subjected to mechanical shock & vibration

Number of samples:

[2] Receptacles, unassembled to P.C.B. used for Phase 1, A1 and A2 (one each)
[2] Receptacles, assembled to P.C.B.
[2] Plugs, unassembled to cable used for Phase 1, A1 and A2 (one each)
[2] Cable assemblies with a plug assembled to one end, 25.4 cm long.

	Test			**Measurements to be performed**		**Requirements**
Phase	**Title**	**ID No.**	**Severity or conditions**	**Title**	**ID No.**	**Performance Level**
A1	Visual and dimensional inspection	ANSI/EIA 364-18	Unmated connectors	Dimensional inspection		
A2	Plating thickness measure-ments					Record thicknesses; see clause 1.1.2
A3	None			Low-level contact resistance	ANSI/EIA 364-23	15 mΩ, maximum, initial per contact mated pair. (Each contact)
A4	Vibration	ANSI/EIA 364-28	Method 5A, 15 min/axis	Continuity	ANSI/EIA 364-46	No discontinuity at 1 μs or longer. (Each contact)
A5	None			Low-level contact resistance	ANSI/EIA 364-23	10 mΩ maximum change from original per contact mated pair. (Each contact)
A6	Mechanical shock (specified pulse)	ANSI/EIA 364-27	Condition A see note 1	Continuity	ANSI/EIA 364-46	No discontinuity at 1 ms or longer. (Each contact)
A7	None			Low-level contact resistance.	ANSI/EIA 364-23	15 mΩ maximum change from original per contact mated pair. (Each contact)

Table 3-1: Performance Group A

Note 1: Connectors are to be mounted on a fixture which simulates typical usage. The socket shall be mounted to a panel which is permanently affixed to the fixture. The mounting means shall include typical accessories such as:

1. An insulating member to prevent grounding of the shell to the panel
2. A PCB in accord with the pattern shown in Figure 7.5 for the receptacle being tested. The PCB shall also be permanently affixed to the fixture.

The plug shall be mated with the receptacle, and the other end of the cable shall be permanently clamped to the fixture.

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3.1.2 Performance group B: Low-level contact resistance when subjected to thermal shock & humidity stress

Number of samples:

[2] Receptacles, assembled to P.C.B.
[2] Cable assemblies with a plug assembled to one end, 25.4 cm. long

	Test			**Measurements to be performed**		**Requirements**
Phase	**Title**	**ID No.**	**Severity or conditions**	**Title**	**ID No.**	**Performance Level**
B1	None			Low-level contact resistance	ANSI/EIA 364-23	15 mΩ maximum, initial per contact mated pair. (Each contact)
B2	Thermal shock	ANSI/EIA 364-32	Condition I 10 cycles (mated)	Low-level contact resistance	ANSI/EIA 364-23	10 mΩ maximum change from initial per contact mated pair. (All samples to be mated)
B3	Humidity	ANSI/EIA 364-31	Condition C (504 hrs.) Method III (cycling) non-energized. Omit 7a & 7b (mated)	Low-level contact resistance	ANSI/EIA 364-23	10 mΩ maximum change from initial per contact mated pair. (All samples to be mated)

Table 3-2: Performance Group B

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3.1.3 Performance group C: Low-level contact resistance when subjected to thermal shock & humidity stress

Number of samples:

[2] Receptacles, assembled to P.C.B.
[2] Cable assemblies with a plug assembled to one end, 2 m. long

	Test			**Measurements to be performed**		**Requirements**
Phase	**Title**	**ID No.**	**Severity or conditions**	**Title**	**ID No.**	**Performance Level**
C1	Withstanding voltage	ANSI/EIA 364-20	Test voltage 500 VDC +50/-50 V Method C (unmated and unmounted)	Withstanding voltage	ANSI/EIA 364-20	No flashover. No sparkover. No excess leakage. No breakdown.
C2	Thermal shock	ANSI/EIA 364-32	Condition I 10 cycles (unmated)	Withstanding voltage (same conditions as C1)	ANSI/EIA 364-20	No flashover. No sparkover. No excess leakage. No breakdown.
C3	Insulation resistance	ANSI/EIA 364-21	Test voltage 500 VDC +50/-50 V (unmated and unmounted)	Insulation resistance	ANSI/EIA 364-21	1 GΩ minimum, between adjacent contacts and contacts and shell
C4	Humidity (cyclic)	ANSI/EIA 364-31	Condition A (96 hrs.) Method III non-energized. Omit steps 7a and 7b	Insulation resistance (same conditions as C3)	ANSI/EIA 364-21	1 GΩ minimum.

Table 3-3 : Performance Group C

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3.1.4 Performance group D: Contact life & durability when subjected to mechanical cycling & corrosive gas exposure

Number of samples:

[2] Receptacles, assembled to P.C.B.
[2] Cable assemblies with a plug assembled to one end, 25.4 cm. long.

	Test			**Measurements to be performed**		**Requirements**
Phase	**Title**	**ID No.**	**Severity or Conditions**	**Title**	**ID No.**	**Performance Level**
D1	None			Low-level contact resistance	ANSI/EIA 364-23	15 mΩ maximum, initial per contact pair. (Each contact)
D2	Continuity housing (shell)			Contact resistance, braid to receptacle shell	ANSI/EIA 364-06	50 mΩ maximum, initial from braid to receptacle shell at 100 mA, 5VDC open circuit max.
D3	Durability	ANSI/EIA 364-09	(a) 2 mated pairs, 5 cycles (b) 2 mated pairs, automatic cycling to 250 cycles, rate 500 cycles/hr +10/-10 cycles			
D4	None			Low-level contact resistance	ANSI/EIA 364-23	10 mΩ maximum change per contact pair. (Each contact)
D5	Continuity Housing (shell)			Contact resistance	ANSI/EIA 364-06	50 mΩ maximum, change from initial from braid to receptacle shell at 100 mA, 5VDC open circuit max.
D6	Mixed flowing gas (in unmated condition)	ANSI/EIA 364-65	Class II exposures: (a) 2 mated pairs-unmated for 1 day (b) 2 mated pairs-mated 10 days	Low-level contact resistance	ANSI/EIA 364-23	10 mΩ maximum change from original per contact pair. (Each contact). Measured at end of exposure.
D7	Durability	ANSI/EIA 364-09	Class II exposures: (a) 2 mated pairs, 5 cycles (b) 2 mated pairs, automatic cycling to 250 cycles, rate 500 cycles/hr +/- 10 cycles			
D8	Mixed flowing gas (in mated condition)	ANSI/EIA 364-65	Class II Exposures: Expose mated for 10 days	Low-level contact resistance at end of exposure	ANSI/EIA 364-23	10 mΩ maximum change from original per contact pair. (Each contact). Measured at end of exposure.
D9	Continuity housing (shell)			Contact resistance	ANSI/EIA 364-06	50 mΩ maximum, initial from braid to receptacle shell at 100 mA, 5VDC open circuit max.

Table 3-4 : Performance Group D

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3.1.5 Performance group E: Contact resistance & unmating force when subjected to temperature life stress

Number of samples:

[2] Receptacles, assembled to P.C.B.
[2] Cable assemblies with a plug assembled to one end, 2 m long.

	Test			Measurements to be performed		Requirements
Phase	**Title**	**ID No.**	**Severity or conditions**	**Title**	**ID No.**	**Performance Level**
E1	Unmating forces	ANSI/EIA 364-13	Mount socket rigidly, insert receptacle by hand Auto Rate: 25 mm/min.	Unmating only	ANSI/EIA 364-13	Unmating force: 1 kgf minimum 4 kgf maximum
E2	None			Low-level contact resistance	ANSI/EIA 364-23	15 mΩ maximum, initial per contact pair. (All contacts in 2 connectors.)
E3	Continuity - Housing (shell)			Contact resistance	ANSI/EIA 364-06	50 mΩ maximum, initial from braid to receptacle shell at 100 mA, 5VDC open circuit max.
E4	Temperature life	ANSI/EIA 364-17	Condition 4 (105° C) 250 hrs. Method A (mated)	Low-level contact resistance	ANSI/EIA 364-23	10 mΩ maximum change per contact pair. (All contacts in 2 connectors)
E5	Continuity housing (shell)			Contact resistance	ANSI/EIA 364-06	50 mΩ maximum, change from initial from braid to receptacle shell at 100 mA, 5VDC open circuit max.
E6	Unmating forces	ANSI/EIA 364-13	Mount socket rigidly. Insert plug by hand. Auto Rate: 25mm/min.	Unmating only	ANSI/EIA 364-13	Unmating force: 1 kgf minimum, 4 kgf maximum

Table 3-5 : Performance Group E

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3.1.6 Performance group F: Mechanical retention and durability

Number of samples:

[2] Receptacles, assembled to P.C.B.
[2] Plugs assembled to cable, one end only, 25.4 cm. long.

	Test			**Measurements to be performed**		**Requirements**
Phase	**Title**	**ID No.**	**Severity or conditions**	**Title**	**ID No.**	**Performance Level**
F1	Mating and unmating forces	ANSI/EIA 364-13	Auto Rate: 25mm/min.	Unmating only	ANSI/EIA 364-13	Unmating force: 1kgf minimum, 4 kgf maximum
F2	Durability	ANSI/EIA 364-09 500 cycles/hr +/- 50 cycles	Automatic cycling to 500 cycles	Unmating only	ANSI/EIA 364-13	Unmating force at end of durability cycles: 1kgf minimum, 4 kgf maximum.

Table 3-6 : Performance Group F

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3.1.7 Performance Group FP: Electrical Test - General Purpose Lines, Single-Ended

Number of samples:

[2] Receptacles, assembled to P.C.B.
[2] Plugs terminated to P.C.B.

	Test			Measurements to be performed		Requirements
Phase	**Title**	**ID No.**	**Severity or conditions**	**Title**	**ID No.**	**Performance Level**
FP5	Impedance Single Ended	EIA 364-67 [1]	TDR method, normalized to 1 ns, single ended 1:1 S:G ratio	Time domain reflecto-meter	EIA 364-67[1]	55 to 75 Ω
FP6	Bandwidth Single Ended	See note[e2]	single ended 1:1 S:G ratio		See note [2]	0.8 GHz Min.

Table 3-7 : Performance Group FP - General Purpose, Single-Ended

Notes: This chart applies only to the thirty general purpose lines.

[1] At the time of the preparation of this standard, ANSI/EIA-364-67 had not been ratified and is cited as a recommended test procedure. The impedance values are described in ohms as calculated from the "% reflection" as specified in ANSI/EIA-364-67.

[2] No current test appendix exists in ANSI/EIA-364 for Bandwidth testing, see Appendix A, Section 4.1 for reference test procedure.

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3.1.8 Performance Group FP: Electrical Tests - General Purpose Lines, Differential

Number of samples:

[2] Receptacles, assembled to P.C.B.
[2] Plugs terminated to 76.2mm (typ.) of semi-rigid 75 ohm cable.

	Test			**Measurements to be performed**		**Requirements**
Phase	**Title**	**ID No.**	**Severity or conditions**	**Title**	**ID No.**	**Performance Level**
FP4	Crosstalk Differential	EIA 364-90 [1]	1 V/500ps Shell only grounded	Measure NEXT & FEXT	EIA 364-90 [1]	5 % Max.
FP5	Impedance Differential	EIA 364-67 [1]	Differential TDR method normalized to 500 ps Shell only grounded Z_{SOURCE} & Z_{LOAD} = 105Ω	Time domain reflecto-meter	EIA 364-67 [1]	105Ω +/- 10%
FP6	Bandwidth Differential	See note [2]	1:1 S:G environment		See note [2]	2.4 GHz Min.

Table 3-8 : Performance Group FP - General Purpose, Differential

Notes: This chart applies only to the thirty general purpose lines.

[1] At the time of the preparation of this standard, ANSI/EIA-364-67 and ANSI/EIA-364-90 have not been ratified and are cited as recommended test procedures. The impedance values are described in ohms as calculated from the "% reflection" as specified in ANSI/EIA-364-67.

[2] No current test appendix exists in ANSI/EIA-364 for Bandwidth testing, see Appendix A, Section 4.1 for reference test procedure.

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3.1.9 Performance Group FP: Electrical Tests - Quasi-coaxial Lines

Number of samples:

[2] Receptacles, assembled to P.C.B.
[2] Plugs terminated to 76.2mm (typ.) of semi-rigid 75 ohm cable.

	Test			**Measurements to be performed**		**Requirements**
Phase	**Title**	**ID No.**	**Severity or conditions**	**Title**	**ID No.**	**Performance Level**
FP4	Crosstalk	EIA 364-90[1]	1 V/ 1 ns	Measure NEXT & FEXT	EIA 364-90[1]	5% Max.
FP5	Impedance	EIA 364-67[1]	TDR method, normalized to 1 ns	Time domain reflecto-meter	EIA 364-67[1]	75Ω +/- 10%
FP6	Bandwidth	See note [2]			See note [2]	2.4 GHz Min.

Table 3-9 : Performance Group FP - Quasi-coaxial Lines

Notes: This chart applies only to the four Quasi-coaxial lines.

[1] At the time of the preparation of this standard, ANSI/EIA-364-67 and ANSI/EIA-364-90 have not been ratified and are cited as recommended test procedures. The impedance values are described in ohms as calculated from the "% reflection" as specified in ANSI/EIA-364-67.

[2] No current test appendix exists in ANSI/EIA-364 for Bandwidth testing, see Appendix A, Section 4.1 for reference test procedure.

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3.1.10 Performance group G: General tests

Suggested procedures to test miscellaneous but important aspects of the interconnect.

Since the tests listed below may be destructive, separate samples must be used for each test. The number of samples to be used is listed under the test title.

	Test			**Measurements to be performed**		**Requirements**
Phase	**Title**	**ID No.**	**Severity or conditions**	**Title**	**ID No.**	**Performance Level**
G1	Electrostatic discharge	IEC 801-2	1 to 8 kV in 1 kV steps. Use 8 mm ball probe. Test unmated	Evidence of discharge		No evidence of discharge to any of the 34 contacts; discharge to shield is acceptable.
G2	Cable flexing [2 plugs]	ANSI/EIA 364-41	Condition I, dimension X=3.7x cable diameter; 100 cycles in each of two planes	Withstanding voltage	per C1	per C1
				Insulation resistance	per C3	per C3
				Continuity	ANSI/EIA 364-46	No discontinuity on contacts or shield greater than 1 μs during flexing.

Table 3-10 : Performance Group G

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4. Appendix A: Measurement Protocols

4.1 Bandwidth Measurements

4.1.1 Scope and Objective

The purpose of this test is to evaluate the bandwidth performance of a connector and/or a connection system. This is necessary to determine the impact of the connection for the system in which it is used.

This measurement is the high-frequency, half-power point (-3dB power point).
The frequency domain procedure used will measure the first order (20dB/decade) half-power point (roll-off frequency) of the connection. This data can then be used to determine the connection's impact on the system in which it is used.

Once the bandwidth data is known, a complex waveform can be analyzed. The complex waveform (system waveform) can be broken down into its fundamental components and each frequency that passes through the connection can be analyzed. Another approach is to convert the bandwidth (frequency domain) data to time domain information and then analyze the impact the connection will have on the system's waveform.

4.1.2 Test Equipment

The equipment of choice for frequency domain measurements is the Network Analyzer. Bandwidth measurements require a swept frequency source and receiver capable of a flat amplitude response over the frequency range of measurement. The Network Analyzer provides both the swept source and tuned (flat amplitude response) receiver ports necessary for the bandwidth measurement.

A test fixture is needed to attach the device under test (DUT) to the network analyzer's two ports.

4.1.3 Test Specimen

Two connections, to the DUT, are described. In each case, a complete connection must be made which will be an accurate representation of the final connection.

1. Connector (mated two pieces): The connector should be a mated pair with multiple contacts. This connector type has contacts that typically consist of two halves that are mated together to complete the connection. Typical applications are board to board, board to wire, and wire to wire.

2. Connection (connector mated to card edge): The interconnection should be complete, in that the test specimen should not be altered electrically when used in a system. For card edge connectors, the mating card edge or connection must be in place to test the connection.

4.1.4 Test Fixture

The test fixture should provide the interconnect between the network analyzer and the DUT. The test fixture can provide the signal to ground pattern for which the DUT will be tested. If the test fixture does not include the signal to ground pattern connections, it should be part of the DUT. The fixture should provide a controlled impedance setup. The fixture should be as similar to the intended application as possible. This includes cable and/or printed circuit board connections.

4.1.5 Test Method

The network analyzer, test fixture, and DUT should be connected as in Figure 4-1. The DUT should be mounted in the test fixture in a manner that is as close to the actual application of the

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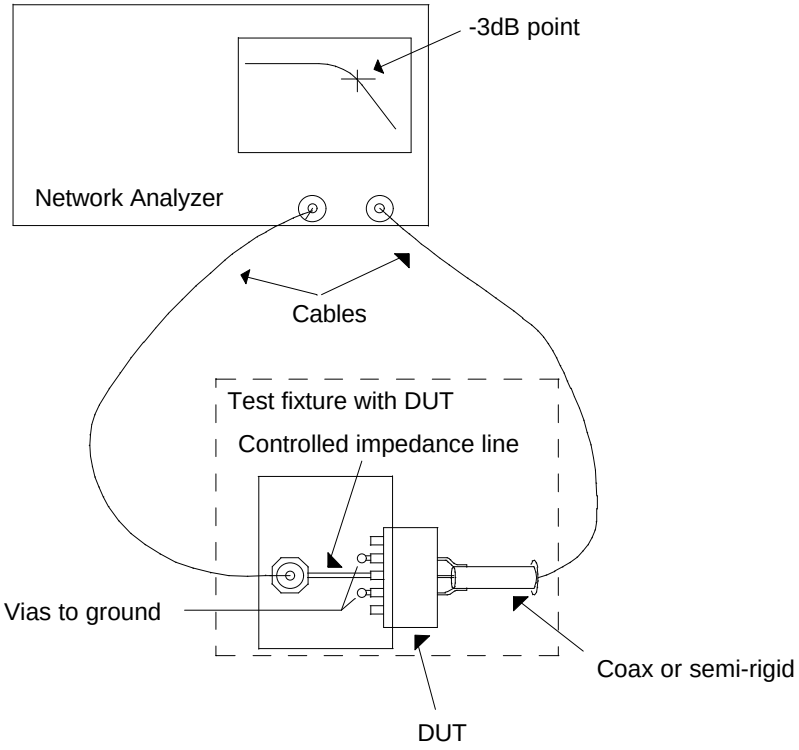
connector as possible. The test fixture connects to the source and receive ports of the network analyzer.

The network analyzer frequency range can be set to sweep logarithmically over several decades to monitor the first order roll-off. The amplitude should be set to monitor in -dB. The DUT can be measured and the corresponding first order roll-off frequency can be monitored at the -3dB point. Filtering should not be used as it can mask the data. However, it can be useful in determining if the -3dB point is the first order roll-off frequency.

Figure 4-1 : Bandwidth Measurement Set-Up



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4.2 Shell-to-Shell and Shell-to-Bulkhead Resistance

4.2.1 Scope & Objectives

This procedure is to be used to determine the shell-to-shell and/or shell-to-bulkhead resistance.

Shell-to-shell resistance is indicative of connector conduction.

Shell-to-bulkhead resistance is indicative of electrical bonding.

4.2.2 Measurement Equipment

1. Voltmeter

Capable of measuring the voltage within +/- 2% of the desired value.

2. Ammeter

Capable of measuring the current within +/- 1% of desired value.

3. Regulated Power

Supply Capable of delivering 1.0A +/- 0.1A

4. Test Probes

   Spherical ends of 1.27mm (0.50 inch) minimum radius shall be used to make contact on the connector and mounting surfaces.

4.2.3 Test Specimen

The test shall consist of a mated connector (plug + receptacle) or receptacle mounted to a conductive surface (bulkhead). Test specimen shall be wired or unwired as specified in the Detail Specification.

When assessing shell-to-shell resistance the mated connectors shall be placed on a non-conductive surface.

4.2.4 Test Procedure

Unless otherwise specified, a current of 1.0A +/- 0.1A dc at 1.5 volts maximum shall be passed through the mated connector or through the receptacle and the mounting surface (bulkhead).

4.2.5 Shell to Shell Resistance

Unless otherwise specified, the voltage drop across the mated connector shall be measured from a point on the rear accessory thread of the plug to the mounting flange on the receptacle. On square flange receptacles, the point of measurement shall be adjacent to the mounting hole.

4.2.6 Receptacle to Bulkhead Resistance

Unless otherwise specified, the voltage drop across the receptacle mounted to the bulkhead shall be measured from a point on the rear of the accessory thread on the plug to a point on the bulkhead next to the mounting flange. Be careful that the probe does not touch the mounting flange.

4.2.7 Details to be Specified

The following details shall be specified in the Detail Specification:

1. Number of samples to be tested.
2. Test current if other than specified herein.
3. Point(s) of measurement if other than specified herein.
4. Voltage drop

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4.2.8 Test Documentation

Documentation shall contain the following:

1. Title of test
2. Description of specimen (and fixture, if applicable)
3. Test equipment used and date(s) of last calibration
4. Values and observations
5. Ambient temperature and humidity (as applicable)
6. Point(s) of voltage measurement
7. Details of receptacle mounting (if applicable)
8. Name of operator and test date

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