Will the Backplane and Daughter Card Contacts Make Contact?

The subject of contact wipe and connector electrical engagement has always been a sensitive issue with both connector manufacturers as well as chassis designers. The issues were particularly troublesome in the days of DIN 41612 type C connectors which were used in Eurocard subracks for 6U VME and 9U applications. To the best of my knowledge, the calculations for contact wipe never were explicitly described depicted in either the DIN or IEC standards relating to the 96 pin connector. However, the classic book on the subject by Dirk Hesse does have a very useful drawing that is based on the DIN standard but addresses directly contact engagement dimensions.

For that connector system the wipe distance is calculated on the attached pages from Dr. Hesse's text to be: 0.54 mm< length <1,26 mm.

As you can imagine the minimum wipe distance of 0.54 mm was a challenge to chassis designers dealing with sheet metal, insertion forces, card tolerance and front panel hardware and the cumulative tolerance's resulting from typical warpage and bow.

The DIN 41612 standard also did not provide a detailed specification for the contact tip geometry. This was much improved in the IEC 61076-4-101 (2mm HM) standard. As a side note, for mid-planes, the world still is waiting for a good rear shroud and long tail contact tolerance specification.

IEEE 1301.1-1991"...Metric Equipment Practice for Microcomputers . . ." addresses contact wipe in Figure A3 "Pin Wipe and Allowance for Different Pin Lengths" and considers the effect of miss-alignment caused by tilt of the plug in unit in the following Table A1 "Effect of Tilt on Pin Wipe".

The rather controversial conclusion that I have arrived at for 19" modular Eurocard subracks is this: Chassis dimensioning should be defined such that when a subrack with a maximum allowed "test dimension" is engaged by a plug in unit with a minimum allowed overall length the backplane connector and the daughter card connector should still fully mate.

The dilemma is that when the subrack condition is with a minimum allowed, "test dimension" and the daughter card is at its maximum allowed overall length, calculations will indicate that the plug in module cannot be fully inserted into position. However, in typical modular Eurocard chassis construction, there is typically enough "give" or flex in the subrack front and rear extrusions, elasticity in the card injector components and flex in the front panel flanges that this "over press" situation is not normally apparent. The addition of front spring gaskets is certainly a help maintaining electrical shield integrity.

If the subrack was designed to nominal dimensions, typical subrack tolerance's would not guarantee electrical engagement for the DIN 96 pin connector under such conditions as would occur in the center of the subrack with a 9U x160 mm daughter card.

Luckily, this subrack system design problem has been partially alleviated in recent years with the advent of connector systems that provide as much as 1.8mm or even 2.5 mm of minimum wipe.

I am not aware of any document that has ever put this thesis into text. However, in my years at AEG as a Eurocard chassis specialist and later at two different companies where I was a Eurocard subrack application engineer, I have concluded that this was the only way to ensure full contact engagement in sheet metal subracks of this design with implementing DIN 41612 connectors.

References:
IEEE Std 1001.1-1991 IEEE Standard for Metric Equipment Practice for Microcomputers-Convection-Cooled with 2 mm connectors.
Eurocard DIN 41612 Connector Design Application & Systems, Dirk Hesse, 1982 Markt & Technik, Munich

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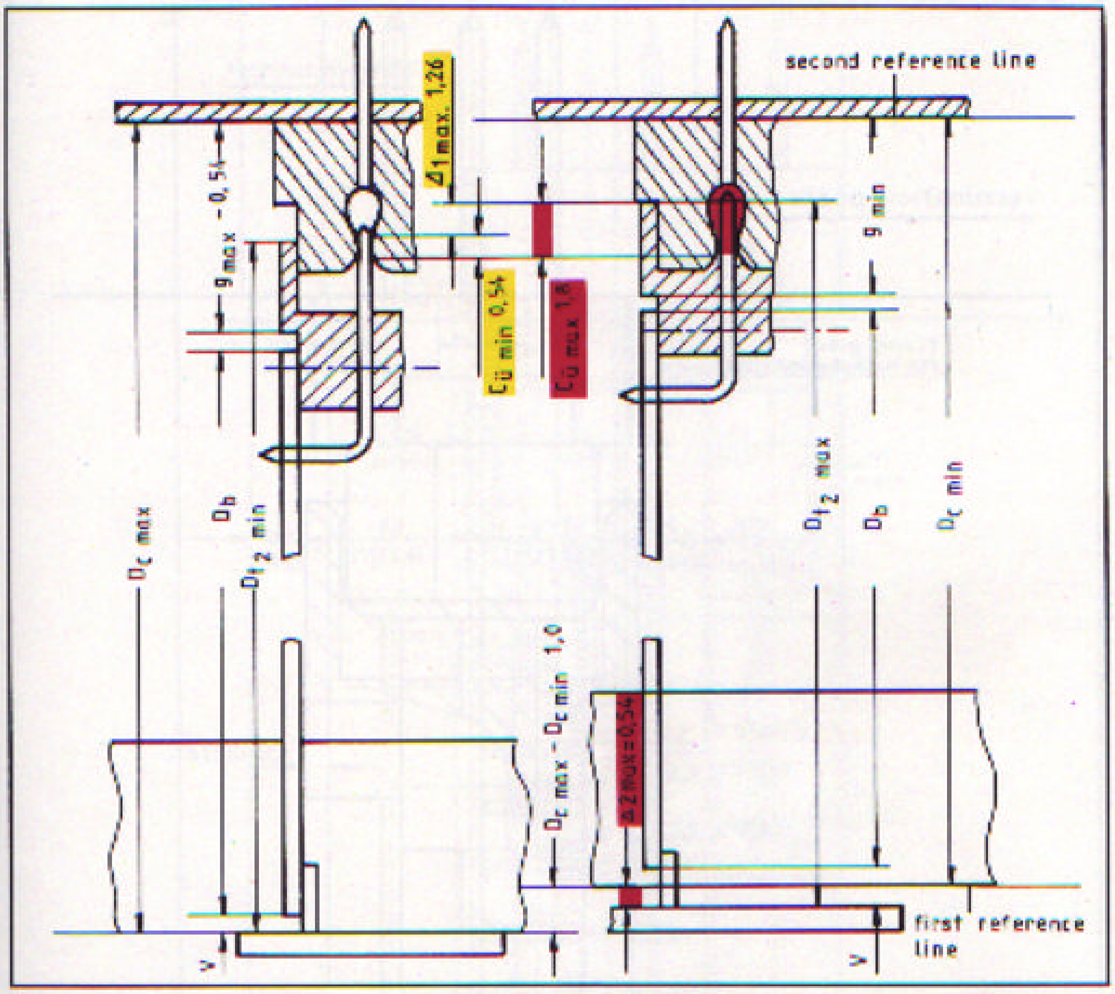

contact overlapping minimum $C_{ü\,min}$
at $D_{c\,max}$ and $D_{t2\,min}$

$D_{c\,max} = D_{c\,nom} + 0{,}86$ (mm) (0,034")
$D_{t2\,min} = D_{t2\,nom} - 0{,}4$ (mm) (0,016")
$\Delta_{1\,max} = 0{,}86 + 0{,}4 = 1{,}26$ mm (0,05")
$C_{ü\,min} = C_{ü\,max} - \Delta_{1\,max}$
$C_{ü\,max} = g_{max} - g_{min} = 14{,}2 - 12{,}4$
$= 1{,}8$ mm (0,071")
$C_{ü\,min} = 1{,}8 - 1{,}26$
$C_{ü\,min} = $ **0,54 mm (0,021")**

front panel overstand maximum $\Delta_{2\,max}$
at $D_{c\,min}$ and $D_{t2\,max}$

$D_{c\,min} = D_{c\,nom} - 0{,}14$ mm (0,0055")
$D_{t2\,max} = D_{t2\,nom} + 0{,}4$ mm (0,016")
$\Delta_{2\,max} = 0{,}14 + 0{,}4$
$\Delta_{2\,max} = $ **0,54 mm (0,021")**
at $C_{ü\,max}$ = 1,8 mm (0,071")

Fig. 50: Contact overlapping $C_{ü\,min}$ and $C_{ü\,max}$ and front panel overstand $\Delta_{2\,max}$ for subunits according to DIN 41494 Part 5
drawing: AEG-TELEFUNKEN