

To: 3P Customers and Business Partners

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3P Newsletter No. 5/2006

Return Loss of Cables-3

Return loss performane of cables related to box packaging, bending / coiling and mean impedance was discussed in 3P Newsletters No. 3/2006 and 4/2006. The present 3P Newsletter continues and now completes the return loss discussion with respect to

- degradation of cable return loss by connecting hardware
- mechanical stability of patch cords
- wall mounting of home cables

Degradation of Return Loss by Connecting Hardware

The cable assembly operation for horizontal cables to connecting hardware may in a few cases cause return loss problems for the permanent link or channel in question. Low performance of connecting hardware is not considered here, and also not low cable performance. The problem discussed concerns an incorrect assembling of cable to connecting hardware, either because of incorrect assembly instructions, poor construction of assembly area of the connecting hardware or bad workmanship by the assembler.

The problem has to do with untwisting of a pair over too long length. The impedance of the pair will be significantly changed by untwisting, which again degrades return loss. However, the length of the untwisted part is essential for the effect of the untwisting. The longer the length of untwisting the lower the frequency for which return loss degradation becomes significant. All cabling standards specify a maximum untwisting length and return loss degradation will not occur for the covered applications if you comply with this requirement.

The problem of reduced return loss performance is normally specific for termination of PIMF

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cables (individual pair foil screened Cat. 6 or Cat. 7) to RJ 45 style connecting hardware. The twisting of a pair is many times very loose for a PIMF cable and removal of the foil then tends to separate the pairs. When the distance from the point of fixing of the cable to the IDC blocks is long (like in some panels) then degradation of return loss may occur in the high frequency end of bandwidth.

The length of the permanent link or channel is significant in connection with its resulting overall permanent link or channel return loss degradation. The return loss noise from the far end will be eliminated by the cable attenuation for long lengths of permanent links and channels. For short permanent links or channels, also the far end reflected signal will be seen in the near end and thus both near and far end reflections will contribute to the degradation of return loss performance.

The above failure pattern is known for return loss, but is not very frequent. However, with respect to near end crosstalk the same length consideration applies and major failures are frequent especially for short Class E / Category 6 and Class E_A / Category 6A permanent links and channels.

Mechanical stability of Patch Cords

The patch cord specifications all include a requirement for maintaining performance during normal handling, i.e. coiling and bending. Handling of a patch cord normally affects only return loss due to the same mechanisms discussed in 3P Newsletters No. 3/2006 and 4/2006. The patch cord specification maintains return loss requirements also after coiling, pushing the coils to both an oval and a figure 8 shape.

With a well fixed core construction of the flexible cable there will be no significant degradation of return loss by the mechanical handling. Otherwise, and for the same reason as discussed before, you will see a significant degradation and non-passing of performance.

Consequently it is strongly advised for the flexible cable producer to carry out the "patch cord" handling tests of the cable to confirm that return loss performance stays unaffected.

Wall Mounting of Home Cables

Installation cables for the home could appear, from a first and fast view, to be less demanding. One might assume that the requirements to use were more simple as the users would not be professionals and with less data rate need than for office applications. This point of view can, however, not be maintained after a closer evaluation. I will not here consider the data rate requirements except mentioning that the home does have shorter channel lengths, which will be significantly helpful for the performance (stronger signal to be received), but on the other hand the home cabling may need higher data rates due to transmission of broadcast signals. The present discussion is aimed on the special consequences for return loss by wall mounting of cables.

Wall mounting of cables is a special installation method for the home. This results in special requirements as covered by the new set of home cable standards released by CENELEC in June 2006.

The standards are:

- EN 50441-1 Cables for indoor residential telecommunication installations
Part 1: Unscreened cables - Grade 1
Authors note: Specified bandwidth is 100 MHz
- EN 50441-2 Cables for indoor residential telecommunication installations
Part 2: Screened cables - Grade 2
Authors note: Specified bandwidth is 100 MHz
- EN 50441-3 Cables for indoor residential telecommunication installations
Part 3: Screened cables - Grade 3
Authors note: Specified bandwidth is 1000 MHz

All these standards cover the special home out-of-wall mounting issues like colour of cables (it is nice and easy that the cables you buy have the same colour on the wall), glueing and stapling. Return loss is affected by repeated deformations of the cable (discussed in 3P Newsletter No. 3/2006), which may be caused by both the cable run over sharp corners of door-casings, wall corners, etc. and the stapling itself. Out-of-wall mounting of horizontal cables is not assumed for office installations. Consequently the home cable standards above include an optional out-of-wall installation simulation test as shown in attachment "Figure 1". Return loss (and near end crosstalk) of the cable must pass the requirements also when tested in this stressed mounting arrangement.

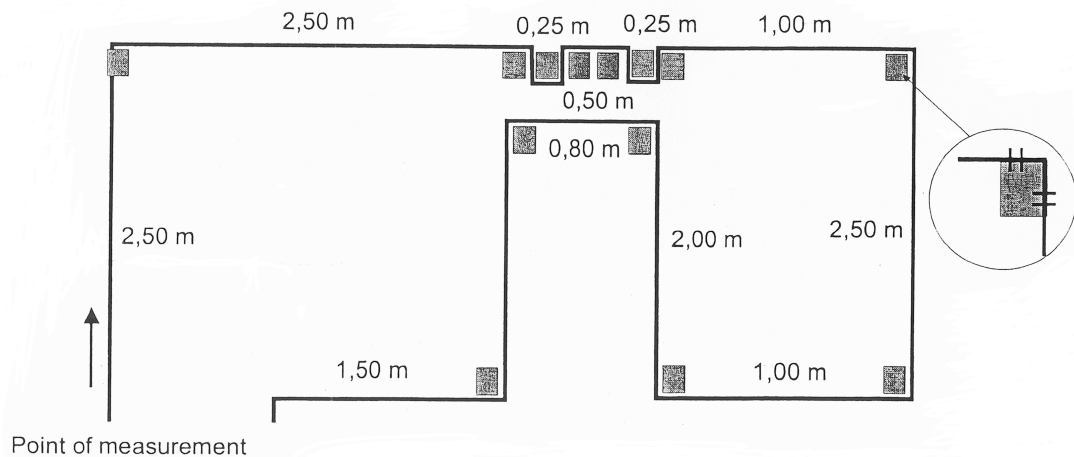


Figure 1 Test set-up for simulation of out-of-wall installation using stapling. Intervals between staples must be as used by the actual installation considered or 20 ± 2 cm.

From the above discussion it will appear that cables intended for out-of-wall mounting will have strict requirements to the stability of the core to avoid significant return loss degradation. Cable suppliers can not assume that the normal office type installation cables can also pass requirements after out-of-wall mounting in a home.

Yours sincerely,
3P Third Party Testing



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