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# New solution in the structured computer networks

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**Abstract**

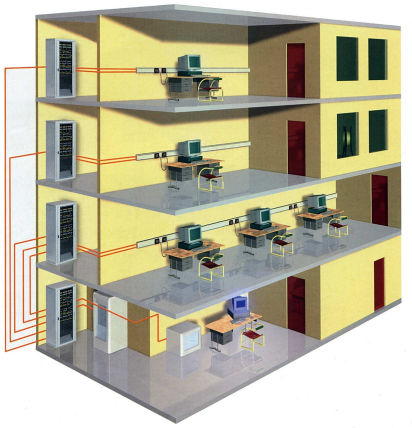
When we build a new computer network, we have to know, that the lifetime of the network only 5-6 years. So we have to rebuild this network in every 5 years. According to this, it is very important to choose the cheapest and the easiest solution. Nowadays this solution is the structured computer network.
On the other hand – especially in the rent office – we have to reconstruct the working place frequently. If we use the structured computer network we can work without any new cable laying, we only have to restucture to the paching cabinet.
I would like to show the principle of the sructured computer networks, and some new solution, especially the standartisation, cables, and testing.

**Key words** Structured computer networks, EMC, Category5e, Category 6, RJ45 socket, path panel, twisted cable

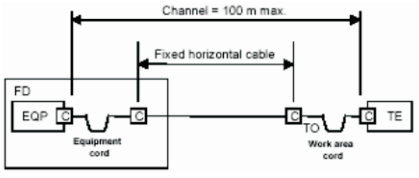
## Introduction

Nowadays one of the most changeable fields is the structured cabling system, in spite of the spread of the wireless technology. If we want to build a new computer network, we have to choose the best solution of the cabling system. This is the prewiring system.
Prewiring a building involves integrating the necessary wiring infrastructure for telekommunications, either at the design stege or during renovation. The majority of prewiring systems accept both telephon and data connections. Low-power distribution must be designed to be both standardized and straightfoward.
Any terminal can then be connected to the user sockets, which avoids disturbing the wiring eacsh time the hardware is upgraded or moved, in the same way as for high-power connections.

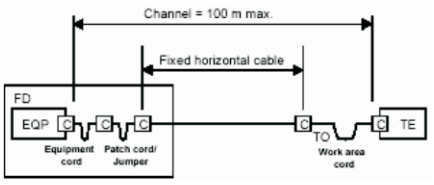
The ideal approachis a star distribution system. Each socket is caonnected to a distributior via a 4-twisted pair cable. For larger installations, each floor distributor is connected to a general distributor wia an optikal fiber.



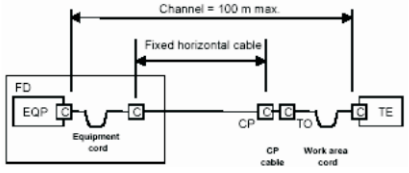
The base of the build of computer networks is the installation standards. Nowadays we use Category 5e (100MHz), and Category 6 (250MHz) standards. These standards consist of four architectures of horizontal cable subsystem.



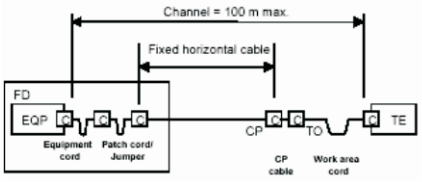

a. interconnect - TO




b. cross connect - TO




c. Interconnect – CP - TO




d. Cross connect – CP - TO

**Fig. 2.**
Architectures of horizontal cable subsystem

The maximum lenght is 100m. The calculed of the lenght of the fixed horizontal cable is the following:

| | | Implementation Equation | | |
|---|---|---|---|---|
| Model | Figure | Class D channels using Category 5 components | Class E channels using Category 6 components | Class F channels using Category 7 components |
| Interconnect - TO | a | H = 109 - Fx | H = 107 - 3 - FX | H = 107 - 2 - FX |
| Cross connect - TO | b | H = 107 - Fx | H = 106 - 3 - FX | H = 106 - 2 - FX |
| Interconnect - CP - TO | c | H = 107 - FX - CY | H = 106 - 3 - FX | H = 106 - 3 - FX - CY |
| Cross connect - CP - TO | d | H = 105 - FX - CY | H = 105 - 3 - FX - CY | H = 105 - 3 - FX - CY |

▪ This lenght reduction is to provide an allocated margin to accomodate insertion loss deviation.

**Fig. 3.**
Calculation of the lenght of the fixed horizontal cable

When the distance is longer then 100m between two active elements we can use the optical fibre.

If we want to install a new computer network, acording to the Category5e, or 6 standards, the most important is that all the equipment needs to be suitable the rule of the standards.

Next to the standards, the EMC of surroundings
is the very iportant question, when we start to plan a computer network. All the equipment, wich is situated next to the computer, activ elements or network have influence on these elements, an each other of course.

**Fig. 4.**
The equipments wich are sources of noise

This influence is the conducted disturbance. The conducted disturbance depend on the type of cable, the distance of the low voltage on high voltage cables, the common lenght, and the equipment wich is the source of noise.

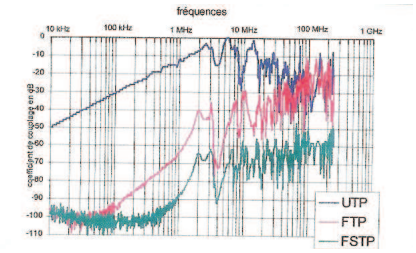



**Fig. 5.**
Measuring acording to the type of cabel

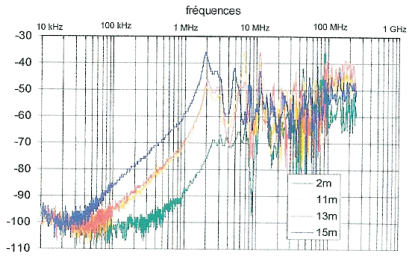



**Fig. 6.**
Measuring acording to the common lenght

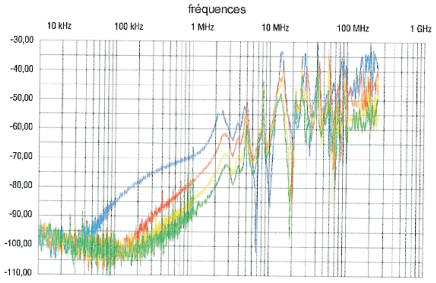



**Fig. 7.**
Measuring acording to the distance between the high and low voltage cables

The structured computer networks consist of the following parts (in our presentation there will be only the passive elements)

1. wall sockets
2. cabinets
3. patch panels
4. cables
5. trunking system
6. accessories

**Wall sockets:**

The RJ 45 sockets is fit the requirements to the standard Category 5e, and Category 6. One of the most important think is the easy installation.
The new generation of the RJ 45 can be install without any tools. According to the EMC the RJ 45 socket can be unshilded, or shilded.
Beside the technical solution the design is a very important question.

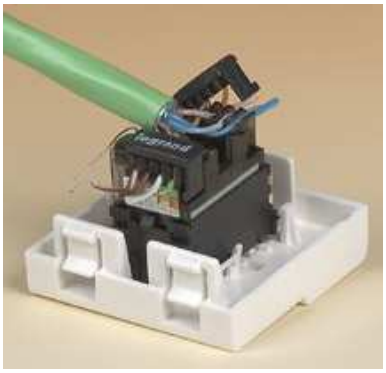


**Fig. 8.**
RJ 45 socket

**Cabinets:**

Wall and standing cabinets. The size of cabinets depends on the number of wall sockets, active elements and other accessories. The cabinets consist of two holders. The distance between this two holders is always 19".

**Patch panels:**

It contains RJ 45 sockets, or/and optical sockets. A new solution can hold the media converter, too. So we can receive the optical signals, transform them to electrical signs and transfer these. All the patch panels have a standard size, wich is 19". Because the holders inside the cabinet have the same distance, we can install these panels directly these holders.

**Cables:**

The longest part of the computer networks are the cables, so they receive the most conducted disturbances.
Our choice depends on the EMC of surroundings, and the protection of the environment.
The basic protection is the twisted pair. Besides, when the EMC is bigger, we can use shielded cable.

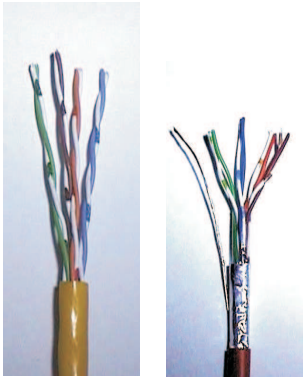


**Fig. 9.**
Different types of cables

**Trunking system:**

It gives us the most variable solution, which can contain the RJ 45 sockets or other wiring accessories.

**Accessories:**

They made the cabling system complete.

**Test:**

When the building of structured computer network is ready, the next step is the test.

The main parameters to be measured:

- mapping of connections
- lenght of links (informative)
- attenuation
- NEXT
- FEXT
- ACR
- return loss

These measurings give us all the information, which is necessary to know.(mapping – quality of connection, attenuation – quality of the cable, NEXT – quality of the wiring, ACR – quality of the transmisson on the prewiring.) After that we can do a decision about the network.

## Conclusion

The structured computer networks are very sensitive to the EMC. If we want to comply with the safety prescriptions and standardizations we have to choose equipment and cables, which are suitable for standardization and against to EMC. Sockets have to have shielded covers, and the cables shielded wrap if it necessary. Have to calculate the lenght of cable, and the NEXT, FEXT, ACR and attenuation are according to this lenght.

## Nomenclature

| | |
|---|---|
| EQP : | euipment (switch) |
| TE : | terminal equipment (computer) |
| TO : | terminal outlet |
| CP : | consolidation point |
| H : | the maximum lenght of the fixed horizontal cable (m) |
| F: | combined lenght of patch cords/jumpers, equipment and work area cords |
| C : | the lenght of the CP cable (m) |
| X : | the ratio of cord cable insertion loss (dB/m) to fixed horizontal cable insertion loss (dB/m) |
| Y : | the ratio of CP cable insertion loss (dB/m) to fixed horizontal cable insertion loss (dB /m) |
| EMC : | elektromagnetic compability |
| NEXT : | near-end crosstalk |
| FEXT: | far-end crosstalk |
| ACR: | attenuation to crosstalk ratio |

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