Application Note

Analog & Digital TV processing with Delta 8

07

Schneider Electric

Presentation

The Delta 8 core unit for home network is fitted with a TV path processor compliant with International TV rules.

The design of a TV distribution system in home, involves the respect of severals rules.

The main requirements of the TV standardisation committees are summed up below. This document covers:

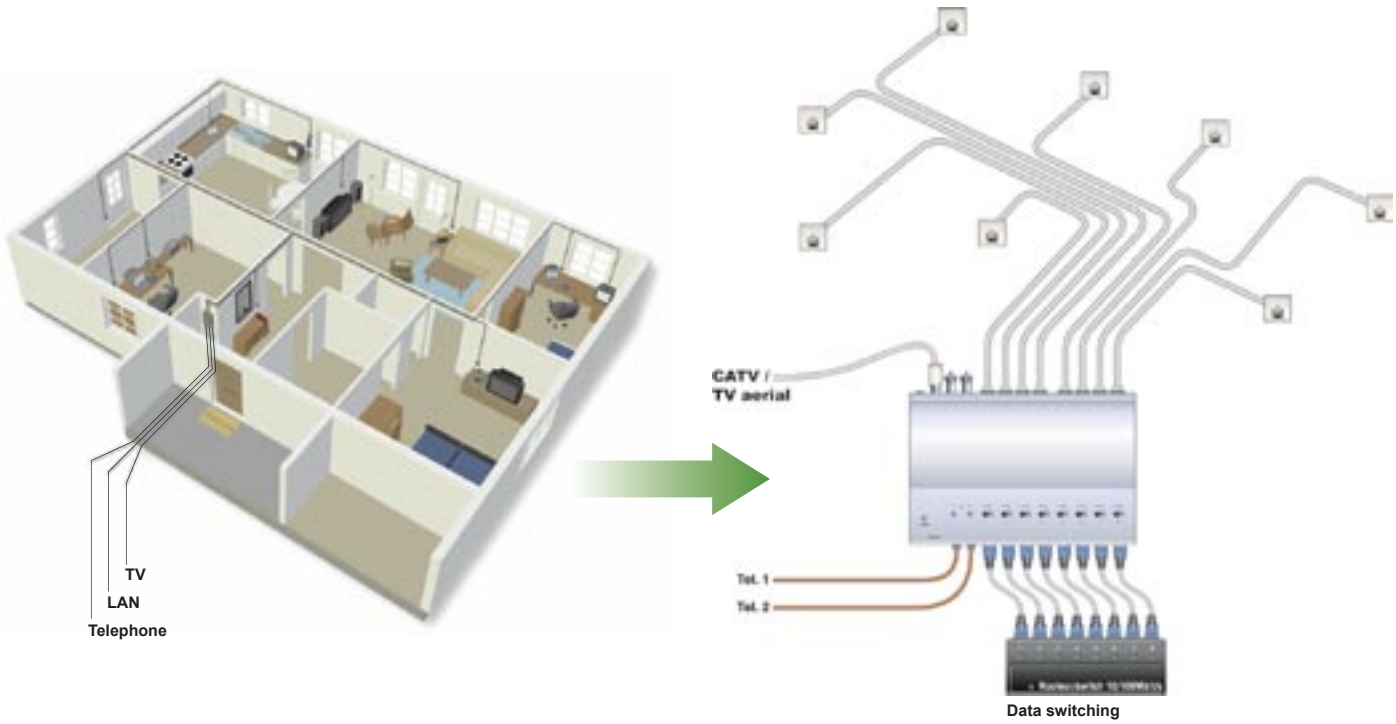
- Signal levels for analogue and digital signals
- Signal quality for analogue and digital signals
- Bit Error Rates for digital signals
- TV signal attenuation in the air and through a cable
- Amplification constraints due to the number of channels to be processed
- Consequences of misprocessing the TV signal.

Then, a special focus will cover the TV processor built-into the Delta 8 core unit.

- Equalisation
- Gain control
- Tilt adjustment.

Notice: the target values indicated were decided by CENELEC, the European standardisation committee and described in the EN50083-x standard. However, some target values may vary according to specific country rules and installation habits.

Delta 8 in Home Networks

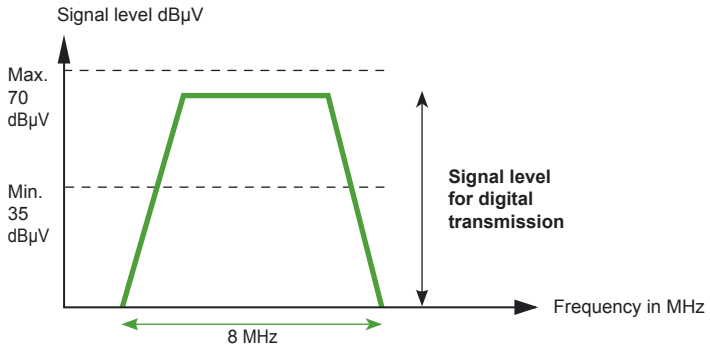


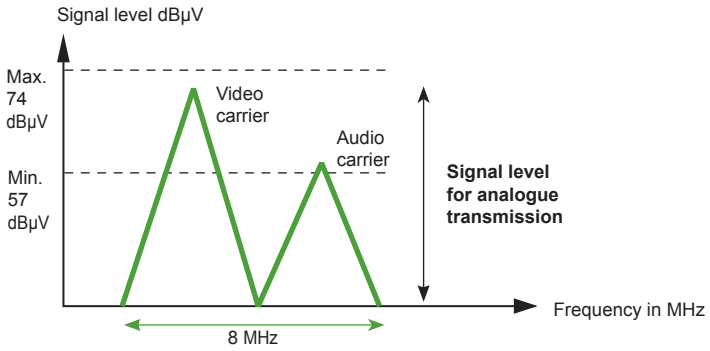
Signal levels for analogue and digital signals

The minimum and maximum values change depending on whether the signal is analogue or digital. There are the values in the frequency range from 47 to 860 MHz at the telecommunication outlet.

Both a minimum and maximum signal level are set out by European TV standards EN500083-x. The aim is to design a TV distribution system that is compliant with tuners fit in devices like TV sets, Set Top Boxes or VCRs.

Signal level	CATV & Terrestrial Transmission	
	Minimum	Maximum
Analogue Signal (Video carrier)	57 dBµV	74 dBµV
Digital Signal	35 dBµV	70 dBµV



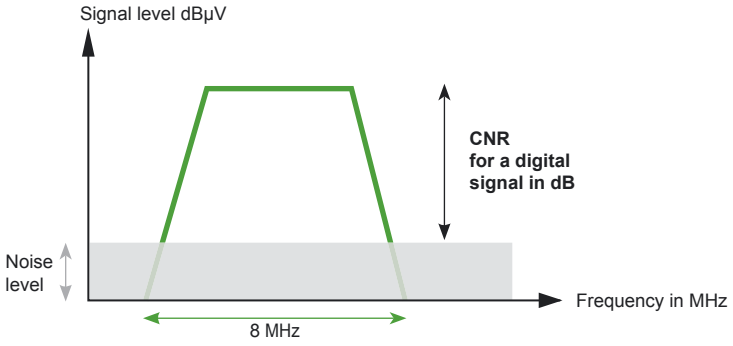


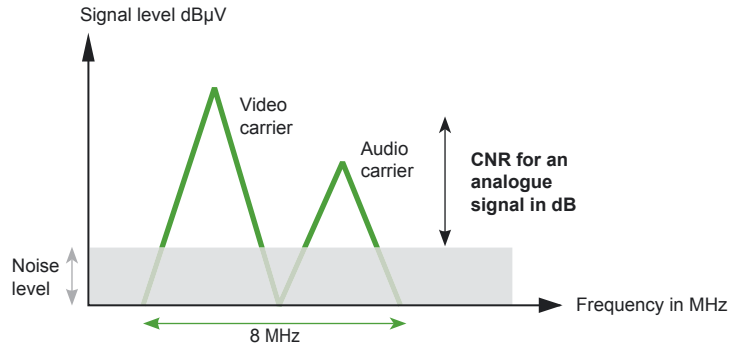
Signal quality for analogue and digital signals

The quality of a TV signal processed by a TV system is mainly measured by the Carrier To Noise Ratio (CNR).

The CNR is the difference between the "useful" signal and the noise level.
All active devices in a TV system contribute more or less greatly to the system noise level.
The higher the CNR, the higher the quality level will be.

Requirement according to EN50083-x	
CNR(dB)	**Terrestrial Transmission**
Analogue Signal	>45.5 dB
Digital Signal	>26 dB





Bit Error Rate for digital signals (BER)

The Bit Error Rate indicates the amount of wrong information detected in a Digital TV signal. The higher the BER, the lower the quality of the Digital TV signal.

This error level can vary considerably depending on the TV processing in the building and in the home. For example if CNR worsens, the Bit Error Rate will also worsen.

The BER normaly expected for a digital channel is 10e-6	
	Max. Bit Error Rate (BER)*
Digital Signal	10e-4

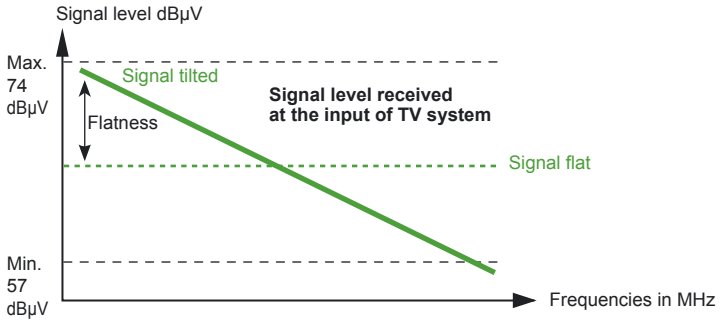
** The rate is expressed as 10 to the negative power.*
For example a BER equals to 10e-4 would indicate that 1 digital info is in error out of 10.000 transmitted.

TV signal attenuation through a cable

Transmitting a TV signal through a cable based TV system causes signal level attenuation. The degree of attenuation varies according to the frequency used for transmitting the signal and the distance covered.

The higher the TV signal frequency, the greater the attenuation.

Consequently, the signal level received on the TV system input to a building or a home is not flat. The signal in the low frequency can be acceptable, but the high frequency signal cannot be received properly.



It is mandatory to equalise the TV level at the output of each wall outlet.
The European standard gives the maximum value as:

	Terrestrial Transmission Maximum Flatness of a TV signal	
	Signal 60 MHz bandwidth	**Within the range 47 to 860 MHz**
TV Signal	6 dB	12 dB

Consequences of TV system misprocessing for the end user

Compliance with TV standards brings the end user the right picture quality on their TV set.
The main problems that may be faced by a TV system, when TV rules are not complied with, are detailed below.

A signal level that is not equalised and is either too high or too low through the TV system, will dramatically disrupt the TV service.

This table shows some TV problems that can occur.

	CNR too low (TV signal too low or noise level too high)	**Signal not equalised, amplifier not adjusted**
Analogue Signal		
	White or black "snow" on-screen	Picture in sound or sound in picture phenomena
Digital Signal		
	Blocks, picture freezing, black screen (BER goes too high)	Blocks, picture freezing, black screen (BER goes too high)

In order to always ensure the right picture and sound quality to every user and whatever their location in the house.

The Delta 8 is fitted with a wide range of set-up and amplification that makes Delta 8 compliant with international standard as EN50083-x.

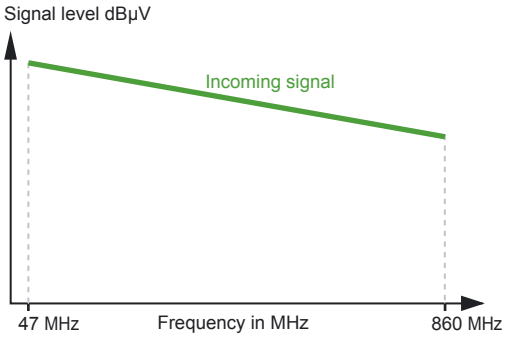
Delta 8 TV adjustment functions with Delta 8 test kit

Delta 8 is fitted with three dedicated TV functions: Equalisation, Gain control and Tilt.

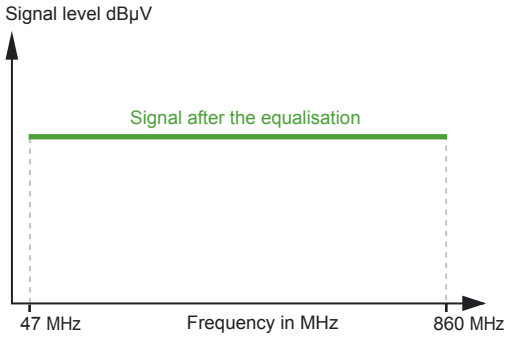
Equalisation function (Tilt at input stage)

The equalisation function equalises the incoming signal. The target is to prepare the signal for proper amplification by the Delta 8 core unit amplifier.

Incoming Signal



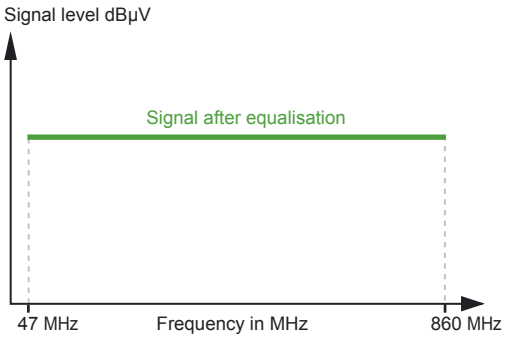
Signal after equalisation



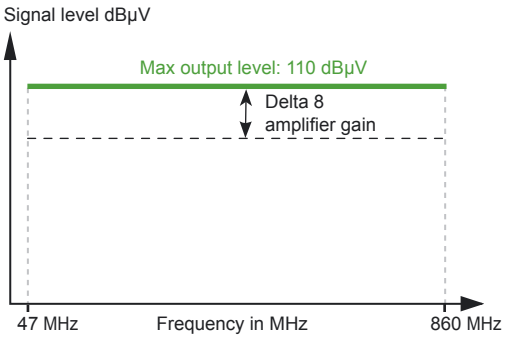
Gain control

The gain control is aimed at amplifying the TV signal and to provide the right output level to the wall outlet.
The gain control has to be adjusted regarding the incoming signal level.

Signal before amplification



TV Signal after amplification



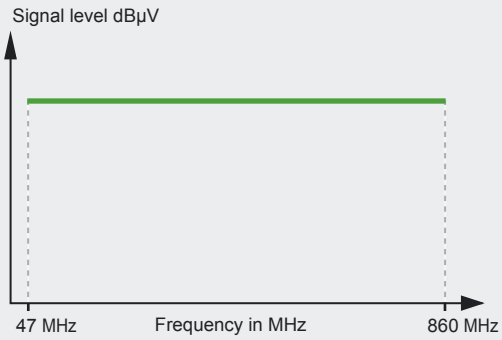
Max. output level	dBµV
Accoding to Din B 3 carriers method	110 dBµV
Accoding to Cenelec CSO / CTB 42 carriers method	93 dBµV

Delta 8 TV adjustment functions with Delta 8 test kit (continued)

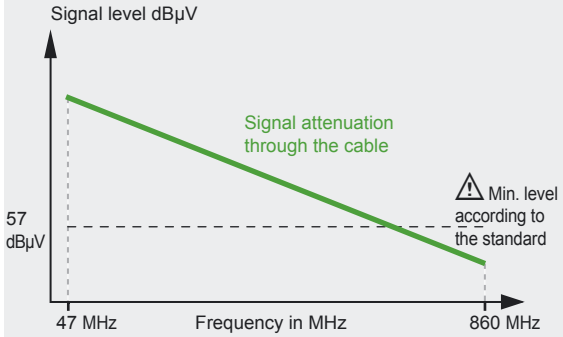
Tilt Control for each link

As it is explained in page 7, the TV signal is attenuated according to the distance and the frequencies.
The tilt adjustement makes a pre accentation at the highest frequencies of the TV signal.
The Delta 8 is fitted with a tilt adjustement for each drop cable (up to 8 wall outlets are handled by the Delta 8 system). This makes the Delta 8 core unit match with the TV standard whatever the drop cable length up to 50 m.

Amplifier without tilt control

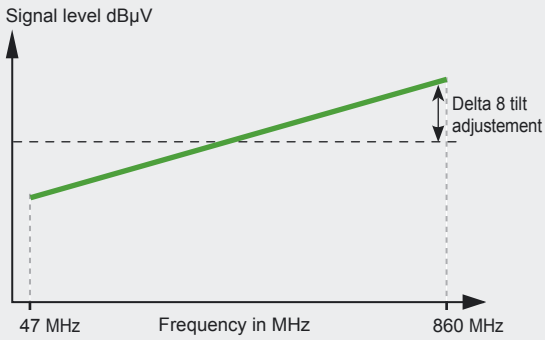


Amplifier without tilt adjustment
⇨ The output level response is flat at the output of the amplifier.

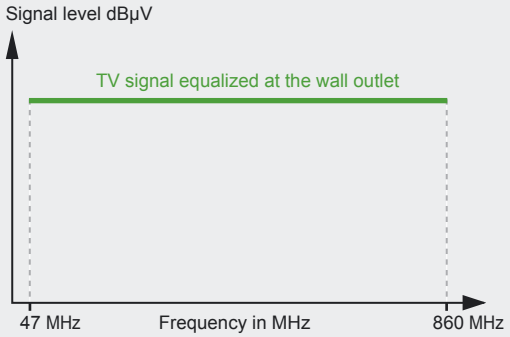


The signal response at the outlet is not flat and ***can be outside of the standard.***

Delta 8 with tilt control



Amplifier with tilt adjustment
⇨ The output level is tilted to compensate for cable losses at the output of the Delta 8.



At the Wall Outlet, the TV signal is flat.
The signal is OK in relation to the standard.

Delta 8 and Delta 8 Test Kit

All of these TV functions can be adjusted accurately using the Schneider Electric Test Kit.
The test kit can emulate a TV signal at 100 MHz and 900 MHz.
The two TV signals are used as a reference for adjusting equalisation gain and the tilt for each drop cable.
Using the Delta 8 Test Kit, it is possible to adjust the Delta 8 core unit without the need for any TV reception on-site.
The delta 8 test Kit is recommended to meet the TV specifications required by international standards.

Conclusion

In order to bring the right picture quality to the customers, a home network TV processing must be fitted with such a range of set-up as Delta 8.

On top of that, the Delta 8 TV processing features make the TV system compliant with International TV standards.

Schneider Electric Industries SAS
VDI Offer Management Department
89, boulevard Franklin Roosevelt
F-92506 Rueil-Malmaison Cedex
Tel: +33 (0)1 41 29 82 00
http://www.schneider-electric.com

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