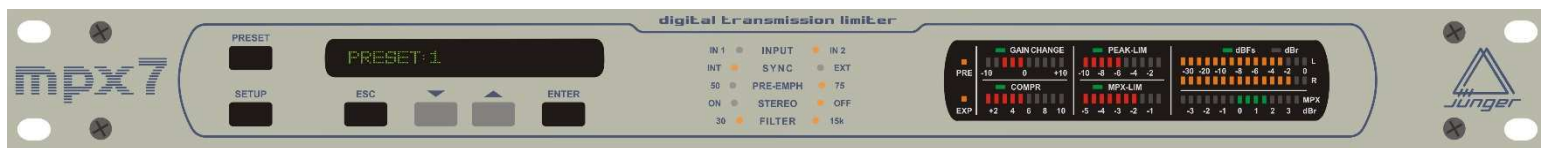


mpx7

digital transmission processor

Manual

release 2.0.2 / 2015-10-09



CONTENTS

A – OPERATION MANUAL

1. **Function description**
 - 1.1. **Basic description**
 - 1.2. **Block diagram**
2. **Installation**
 - 2.1. **Unpack the unit**
 - 2.2. **Power supply**
 - 2.3. **Connections**
 - 2.4. **Rack mounting**
 - 2.5. **Operation safety**
 - 2.6. **Synchronization of digital output**
 - 2.7. **Audio connections**
 - 2.8. **Remote Control**
 - 2.8.1. **GPI Remote Control**
 - 2.8.2. **Tally Out**
 - 2.8.3. **Serial Remote Control**
 - 2.9. **LAN interface (optional)**
3. **Location of parts and controls**
 - 3.1. **Front panel**
 - 3.2. **Rear panel**
 - 3.3. **Switches and jumpers for configuration**
4. **Operation**
 - 4.1. **Front panel operation / mpx7 keys**
 - 4.1.1. **Navigation**
 - 4.1.2. **Main Display**
 - 4.1.3. **Menu Preset / Setup**
 - 4.1.4. **User presets**
 - 4.2. **Operation via web interface**
 - 4.2.1. **Controller LAN**
 - 4.2.2. **Parameter Settings mpx7**
5. **Boot display and trouble shooting**
 - 5.1. **Boot display**
 - 5.2. **Error messages and trouble shooting**
 - 5.3. **Initialization of the unit**
6. **Technical specifications**
7. **Declaration of Conformity - CE**

B – APPLICATION NOTES

- 1. The Junger Audio Dynamics Processor Principle**
- 2. The Junger Audio Compressor & Expander Principle**
- 3. The Junger Audio Processing Presets**
- 4. Network Integration for TCP/IP Operation**
- 5. FM-Processing d07/mpx7**
 - 5.1. General**
 - 5.2. MPX-Limiting**
 - 5.3. Pre-emphasis**
 - 5.4. Terms and definitions**

FOREWORD



Thank you for buying and using the transmission processor mpx7.

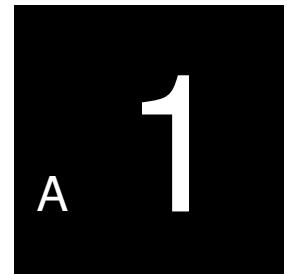
You have not only acquired the latest generation of digital dynamic range processing, but also a piece of equipment which is unique in its design and specification.

Please read this manual carefully to ensure you have all the information you need to use the mpx7.

The unit was manufactured to the highest industrial standards and went through extensive quality control checks before it was supplied.

If you have any comments or questions about installing, setting-up or using the mpx7, please do not hesitate to contact us.

FUNCTIONAL DESCRIPTION



The mpX7 is designed for optimised mpX-power, adaptive pre-emphasis and brickwall limiting of program signals for FM broadcast and TV transmission.

It does provide reliable protection of transmission paths against overload at the output of studios, OB vans as well as satellite up-links. The device operates fully digitally and, besides AES/EBU interface, it makes use of high end 24bit A/D converters so that digital dynamic processing is possible for analog as well as digital signals.

The dynamic range processor principles developed by Junger Audio enable level managing devices like compressors, AGC and limiters to be produced with exceptionally high audio quality, without coloration, pumping, breathing, distortion or modulation effects sometimes associated with this type of processor.

In short, almost inaudible processing - with ease of use.

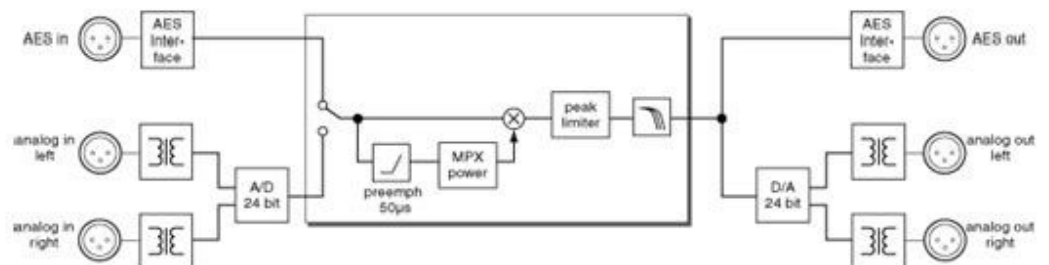
The unit is easy to operate and requires only a limited number of settings to be made by the user to achieve optimum results. All other parameters necessary for inaudible processing are continuously automatically controlled in response to changes in the programme signal.

1.1 BASIC DESCRIPTION

1.2 BLOCK DIAGRAM

features

- 2-channel digital audio amplifier and limiter for broadcast transmission signals
- audio signal processing in consideration of pre-emphasis and MPX-Power
- Digital I/Os, AES/EBU format
- 24bit ADV and DAC
- Stereo and dual channel mode
- Parallel and serial remote control



block diagram digital transmission limiter mpx7

Further description of the processor principles see Application notes B!

INSTALLATION

The digital audio level processor mpx7 was carefully packed in the factory and the packaging was designed to protect the equipment from rough handling. Please examine carefully the packaging and its contents for any signs of physical damage, which may have occurred in transit.

The digital audio level processor mpx7 is a device under the safety category *Schutzklasse 1* in keeping with the VDE 0804 standards and may only be used with power supply installations built according to regulations.

Check the voltage details printed at the rear panel are the same as your local mains electricity supply.

The digital audio level processor mpx7 is equipped with standard connectors (see also chapter 3).

Before connecting the digital audio level processor mpx7 switch the power off at all connected units.

The digital audio level processor mpx7 is made as standard 19" unit (EIA format). It occupies 1 RU (44 mm height) space in a rack. Please allow at least additional 3" depth for the connectors on the rear panel.

When installing the unit in a 19" rack the rear side of the unit needs some support, especially for mounting in flight cases.

The digital audio level processor mpx7 should not be installed near units which produce strong magnetic fields or extreme heat. Do not install the audio processor directly above or below power amplifiers.

If, during operation, the sound is interrupted or displays no longer illuminate, or if abnormal odor or smoke is detected immediately disconnect the power cord plug and contact your dealer or Jünger Audio.



2.1 UNPACK THE UNIT

2.2 POWER SUPPLY

2.3 CONNECTIONS

2.4 RACK MOUNTING

2.5 OPERATION SAFETY

2.6 SYNCHRONIZATION OF DIGITAL OUTPUT

The digital transmission processor mp7 has a digital signal output. For the problem-free combination of following digital devices, the digital signal processing can be locked to an external clock reference. The selection of the corresponding sync source is made in the SYNC MODE menu during setup. If the chosen sync input is connected with the sync signal, this signal is used for synchronization automatically. All sync sources can be used for locking A/D-converters at the analogue inputs as well. The digital output signal can be clocked with the following clock frequencies:

- INTERNAL** locks both the A/D-converters and the digital output with the internal reference 44,1 or 48 kHz. Digital inputs are connected via sample rate converter
- AES INPUT** locks with the clock frequency of the input signal at digital input CH 1/2 (AES/EBU, 44,1...48 kHz)
- EXT AES** locks with the AES signal at the sync input (AES, 44,1...48 kHz) Digital inputs are connected via sample rate converter
- EXT WCLK** locks with the word clock signal at the sync input (WCLK, 44,1...48 kHz) Digital inputs are connected via sample rate converter

optional:

- EXT VIDEO** locks with black burst at sync input (internal 48 kHz) Digital inputs are connected via sample rate converter

2.7 AUDIO CONNECTIONS

The analog audio inputs are RFI filtered and analogue outputs are balanced and floating like transformer coupled devices. All the audio connectors are via rear panel mounted connectors. Standard XLR connectors are used. These are always wired to the AES standard:

pin 1	X	Screenscreen
pin 2	L	Live audio 0°
pin 3	R	Return audio 180°

Balanced connections are preferred whenever the other equipment provides balanced inputs/outputs. All line level connections should be wired with twin screened cable for low noise and reliability. The screens of the cable should be connected at one end only. Input cable screening therefore needs to be derived from the signal source end as pin 1 is ground lifted at low frequencies for the inputs.

If the equipment driving the digital audio level processor mp7 has unbalanced outputs then you will need to add a wire jumper such that the screen connection of Pin 1 of the XLR is shorted to Pin 3.

If the equipment being connected to the mp7 have only unbalanced inputs, then we recommend still to use a balanced (ie. 2 core shielded cable) cable where Pin 1 and Pin 3 are connected in the cable ends away from the digital audio level processor mp7.

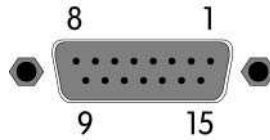
The digital transmission processor mpX7 can be remote-controlled by means of parallel GPI contacts.

use : remote-controlled changeover of presets

connector: D-SUB 15pin, female

Pin assignments

Connector : D-SUB 15pin female panel jack



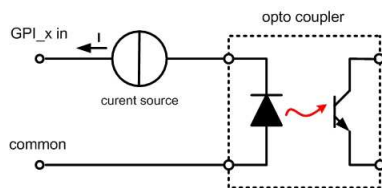
Pin assignment of the connector :

Pin	Signal name	Functions
1	GPI 1 in	Defined by mpX7 config
2	GPI2 in	Defined by mpX7 config
3	GPI3 in	Defined by mpX7 config
4	GPI4 in	Defined by mpX7 config
5	GPI5 in	Defined by mpX7 config
6	GPI6 in	Defined by mpX7 config
7	GPI7 in	Defined by mpX7 config
8	GPI8 in	Defined by mpX7 config
9	+5V	110 Ω
10	GPI 1/2 common	
11	GPI 3 common	
12	GPI 4 common	
13	GPI 5 common	
14	GPI 6Common	
15	GPI 7/8 common	
Shield	GND	

Electrical specification:

GPI input

potential free by opto-coupler in line with a current source



ON: -3.5...-30V between **GPIx** input and **GPx common**
OFF : less then 1.5V between **GPIx** input and **GPIx common**

Signal duration must be at least 50msec.

Note : An internal auxiliary voltage feed of +5V is available on pin 9 via a 110 Ω resistor. Ground is available from the shield of the connector only! When using the auxiliary voltage feed, there is no electrical isolation given anymore and the risk to inject unwanted noise is high!

Important Note : You must take care about the polarity of the external voltage applied to the GPIs. **Wrong polarity** may **destroy electronic components** and may **cause fire** inside the MPX7!

2.8 REMOTE CONTROL

2.8.1 GPI REMOTE CONTROL (PARALLEL REMOTE)

2.8.2 TALLY OUT

The digital audio level processor mpX7 can transmit specific device statuses via parallel Tally lines.

use: Control of the mpX7 status

Connector : D-SUB 25pin
female panel jack

Pin assignment of the connector :

Pin	Signal name	Functions
1	Tally 1 normally closed	
2	Tally 1 normally opened	Defined by mpX7 config
3	TALLY 2 common	
4	Tally 3 normally closed	
5	Tally 3 normally opened	Defined by mpX7 config
6	TALLY 4 common	
7	Tally 5 normally closed	
8	Tally 5 normally opened	Defined by mpX7 config
9	Tally 6 common	
10	Tally 7 normally closed	
11	Tally 7 normally opened	Defined by mpX7 config
12	TALLY 8 common	
13	+ 5V	110 Ohm
14	TALLY 1 common	
15	Tally 2 normally closed	
16	Tally 2 normally opened	Defined by mpX7 config
17	TALLY 3 common	
18	Tally 4 normally closed	
19	Tally 4 normally opened	Defined by mpX7 config
20	TALLY 5 common	
21	Tally 6 normally closed	
22	Tally 6 normally opened	Defined by mpX7 config
23	TALLY 7 common	
24	Tally 8 normally closed	
25	Tally 8 normally opened	Defined by mpX7 config
Screen	GND	

Electrical specifications:

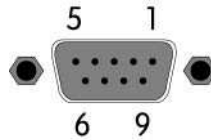
Tally output relay : common / normally closed / normally opened
 24V - 1A
 125V - 0,5A
 $P_{max} = 62,5VA$

The digital audio level processor mpX7 can be remote-controlled by means of serial remote RS-232/422.

use : remote-controlled changeover of presets

protocol: available on request

Connector : D-SUB 9pin
female panel jack



Pin assignment of the connector in serial interface mode :

Pin	Signal name	Functions
1	Rx +	RS422
2	TxD	RS232
3	RxD	RS232
4	NC	not used
5	GND	Ground
6	Rx -	RS422
7	NC	not used
8	Tx -	RS422
9	Tx +	RS422

Pin assignment in CAN-bus mode :

Pin	Signal name	Functions
1	NC	Not used
2	CAN-I	CAN-bus low signal
3	NC	Not used
4	NC	Not used
5	GND	Ground
6	GND	Ground
7	CAN-H	CAN-bus high signal
8	NC	Not used
9	NC	Not used

This connector has multiple functions. It can be either used as a serial interface connector serving the RS232 or RS422 format (J2, internal jumper selected).

Electrical specification:

signal in-/outputs

TTL-level

2.8.3 SERIAL REMOTE CONTROL (RS-422)

2.9 LAN INTERFACE

Connector : RJ 45 with status LEDs
8 pin panel jack

Pin assignment of the connector :

Pin	Signal name	Functions
1	TX +	Ethernet send
2	TX -	Ethernet send
3	RX +	Ethernet receive
4		
5		
6	RX -	Ethernet receive
7		
8		
9		

Electrical specifications: 100Mbit/s auto negotiation port

Application remarks :

This port allows remote control of the mpX7 by TCP/IP over Ethernet. Setting up the network configuration is described in B 6.

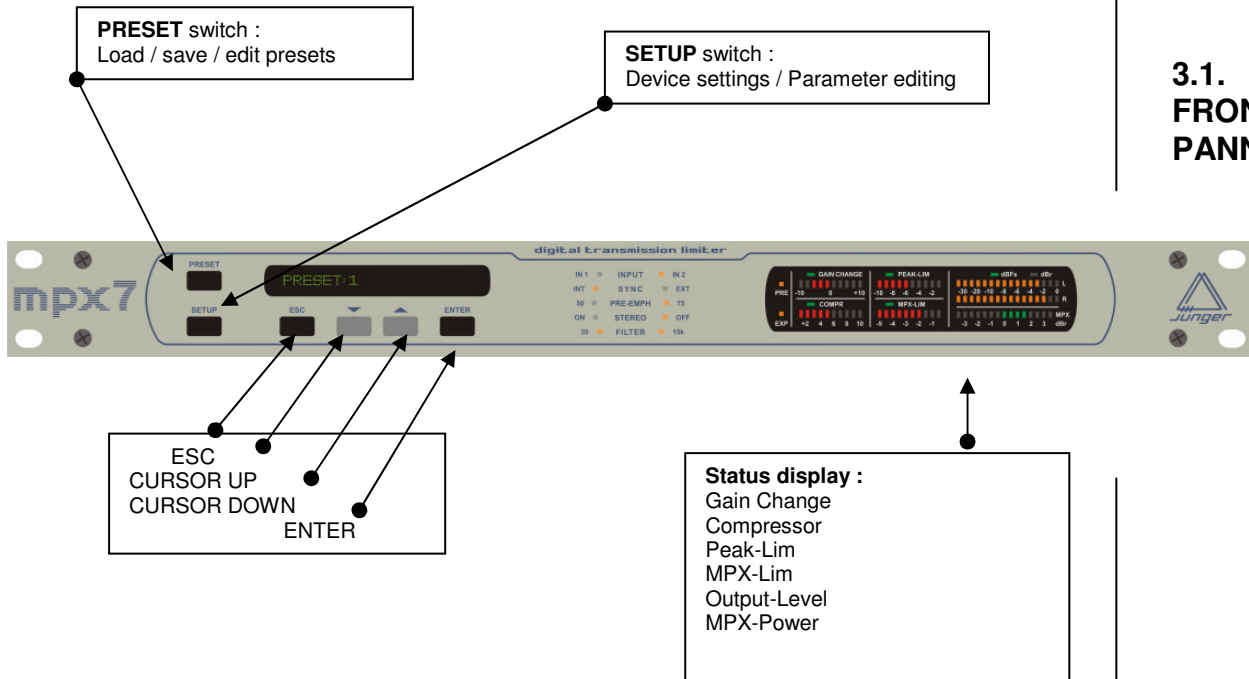
The Ethernet Controller features operation via web browser. Please refer to A 4.2 "Operation via web browser".

For details pls. refer to B 4 "Network integration", A 4.2 "Operation via web interface"

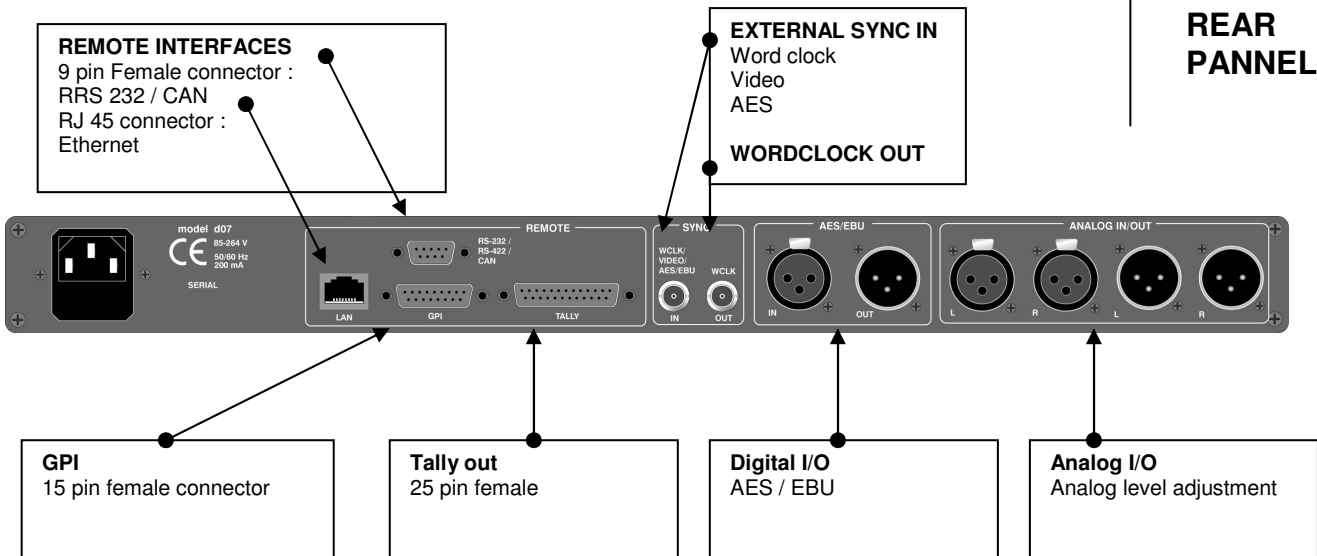
LOCATION OF PARTS AND CONTROLS



3.1. FRONT PANNEL



3.2 REAR PANNEL



3.3 Switches and Jumpers for Configuration

POWER INPUT

IEC mains input connector 85-264V, 50/60 Hz with integrated fuse

REMOTE

serial remote interface RS-422 (232)
connector: 9pin SUB-D, female

GPI

parallel remote interface
TALLY-out open relais contact
connector: 25pin SUB-D, female
GPI-in +3,5...+30V potential-free
connector: 15pin SUB-D, female

SYNC

SYNC IN input for ext. sync signal (AES 3 format, 75 Ohm, unbal)
or video sync signal (blackburst, 75 Ohm, unbal) or
wordclock sync signal, TTL level, unbal
connector: BNC socket

WCLK OUT output for word clock (system clock of d07)
connector: BNC socket

DIGITAL IN

input for AES/EBU standard format
connector: XLR female panel jack

DIGITAL OUT

output for AES/EBU standard format
connector: XLR male panel jack

ANALOG IN/OUT

Analog input to 24 bit A/D-converter
Input floating balanced, XLR connector female
Analog output from 24 bit D/A-converter
Output floating balanced, XLR connector m

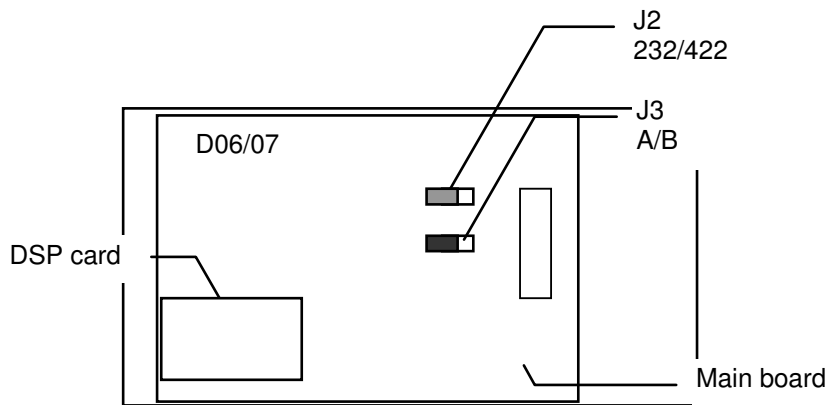
Some basic settings can be made by switches and jumpers at the internal circuit boards of the unit. These settings can occur general changes for operation and should be made by qualified engineering staff only.

Internal

To set any internal jumper or switches it is necessary to open the unit.
**PLEASE DO NOT MAKE ANY ALTERATIONS WITH THE MAINS STILL
CONNECTED TO THE UNIT!**

Loosen the screws on the top cover and remove. Then you can see all jumper and switches as shown in the drawing below. After setting of jumper or switches reassemble the unit in opposite order.

Selection of the serial remote interface



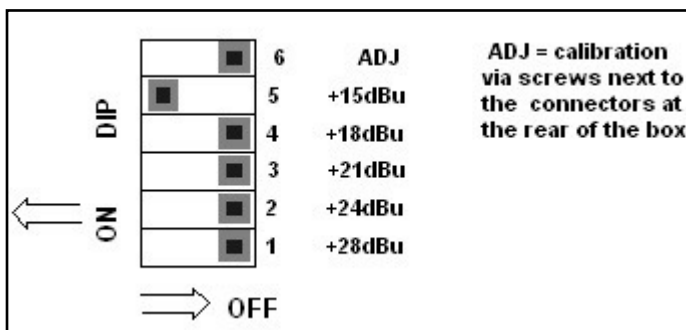
J2 – RS-232 / RS-422: Selection of the serial remote interface (see 3.8.3)

J3 – A / B: for factory use only, set to A

calibration of the analog in-and outputs

At our factory the d06 is calibrated German broadcast standard +15dBu = 0dBFS. If you want to use a different referencer standard (say +24dBu = 0dBFS) you can change the setting via dip switches on the main board of the d06.

→ The switches are near the analog input and output hardware on the PCB.



With factory setting of +15dBu=0dBFS the dip switch "+15dBu" will be turned ON. To change the setting to another standard you just have to slide this dip switch to the right (OFF) and slide the needed dip switch that corresponds to the reference standard you are using to the left (ON).

→ Make sure that there is always just ONE dip switch turned ON!
Exception: They may all be OFF if you are using a CUSTOM reference level

CUSTOM Reference Level (using Switch 6 ADJ)

If none of these standard reference settings correspond to your needs you can set the reference to a CUSTOM level by adjusting the input sensitivity by the two potentiometers (L and R) next to the analog input and output connectors at the rear of the box.

→ This should only be done by experienced engineers with measuring instruments!

To set the reference level manually, follow these steps:

1. Set all dip switches to "OFF" except #6, ADJ. –set it to ON
2. Adjust the potentiometers to the desired CUSTOM reference (setting). For this you need to feed the analog input with a known reference level and measure the digital output.
Make sure that the DSP processing is bypassed, otherwise there could be DSP gain active!
3. When the adjustments are complete, 'capture' the custom settings by setting dip switch #6 to OFF.
Otherwise your reference level could be changed by accident at the potentiometers.

rear of the box. This should only be done by experienced engineers with measuring instruments! After having adjusted the input level bring the dip switch back to the "OFF" position.

Operation



The mpx7 transmission limiter is very easy to use.

You can do all settings with the keys on the front of the device or via webinterface. Additionally GPI/O's can be used for switch/signalization of settings.

The mpx7 uses two groups of data, in the **SETTINGS** area to set up device functions (selection of an input, synchronization or input of a device name) and in the **PARAMETER** area to control the signal processing (setting up processing parameters, MPX-limiter, etc.).

SETUP directs to the set up menus. Here one can select between **SETTINGS** for device related settings and **PARAMETER** for signal processing settings.

PRESET directs to loading, saving and editing of one of the user **PRESETs**.

All current data is kept in a non volatile memory. Therefore they are immediately available when turning on the device. All changes to a parameter are effective immediately. Pressing **ENTER** will approve it. By pressing **ESC** the changes will be rejected and the display returns to the parameter menu.

Loading of a **PRESET** will immediately carry over the values into the operating memory. By clicking free cross fade they will be effective immediately.

There is the possibility to edit and store **PRESETs** in the back ground, without taking them over into the operating memory to prepare the device for a different kind of program that is awaited.



NAVIGATION through menus of the mpx7 is done by the

  **ENTER** **ESC** keys :

ENTER directs into the next possible navigation level

- exit settings
- stores altered values
- directs back to the previous navigation level

ESC abort (changes are rejected)
- back to the previous navigation level

 - scrolling through the navigation level
and
 - altering of values


4.1 FRONT PANEL OPERATION mpx7 keys

4.1.1. NAVIGATION

4.1.2. MAIN DISPLAY

When you switch on the mpX7 the main display will show you the current **controller software** and **hardware version** of your device. You can always have a look on it by pressing **ENTER** if you are not in a menu (**SETUP** or **PRESET**).

After a few seconds the main display switches to showing the input level (R/L).

By pressing  you can step through the following status details:



Display	Description
MAIN DISPLAY	
MPX7 C:xx D:yy L: xxx R: xxx	Device, Controller software, DSP version Input Level channel L/R in DBFS/dBr (CONFIG out meter)
MPX7 DEVICE	Device name, 16 characters possible (CONFIG device name)
PRESET x: yyy	Shows current preset
MPX-POWER -14.9dB	Shows actual MPX-Power of the output signal

4.1.3. MENU Preset / Setup

The chart on the following pages gives an overview over the menu structure, its parameters and the available ranges:

Menu item	Value/range	Description
PRESET*		
LOAD PRESET	Preset 1-4	<i>User presets</i>
EDIT PRESET	Preset 1-4	<i>Here you can change the settings of your individual presets</i>
SAVE PRESET	Preset 1-4	<i>Here you can save your individual preset in one of 4 available user presets</i>

* When you switch on your mpX7 or initialize it, the "initialize" preset is loaded. Before you start checking the parameters of the mpX7 you should load one of the factory presets.

4.1.3. MENU Preset / Setup

SETUP		
SETTINGS		
INPUT	INPUT 1: analog INPUT 2: digital	Select the input mode according to your input signal (analog/digital AES/EBU)
PASSWORD	1 2 3 4 (factory preset)	Set your own password to lock the device
LOCK	OFF/ON	Device can be protected against accidental changes while transmission operation
OUT METER	dBFS/dBr	Select between the display of relative output level in dBr to the setup value of the limiter or absolute value in dBFS
DEVICE NAME	16 characters possible	Set your individual device name
CAN ID	00-99	Device address for the CAN-bus for the remote control (optional)
TALLY 1-8	off, preset 1-4, stereo, Lim, Preemp, Clip, Input2, Bypass	8 TALLY outputs are carried out as relay change-over switches. One of 12 states of the mpx7 can be allocated to them
GPI 1-8	off, preset 1-4, stereo, Input2, Bypass	GPI input are carried out as opto coupler driven by a current source. One of seven predefined states of the mpx7 can be remote controlled by them
SYNC	Video, Wclk, Ext AES, Input AES, INT 44.1, INT 48	Selection of the SYNC source

PARAMETER		
GAIN		-20 to +20dB Setting the initial gain
STEREO		OFF/ON For stereo operation with the mpx7 the control circuits of the dynamic sections can be linked
FILTER	30Hz	OFF/ON Switching off/on 30Hz low cut filter
	15kHz	OFF/ON Switching off/on 15kHz-FIR-Filter
PREEMPHASIS	PRE MODE	OFF/50µs/75µ The mpx7 controls high frequency signal components to adapt the audio signal to the predefined pre-emphasis.
	PRE THRES	Setting has to be equal/bigger than the Limiter Thresh (see B 5.3)
PEAK-LIMITER	LIM THRESH	determines the max output level of the mpx7
	LIM PROG	Pop, speech, uni, live, classic Characteristic of the LIMITER can be adapted to the program material
MPX-LIMITER	MPX-POWER	OFF/ -4 to +4dB Limits the power of the MPX-signal

**4.1.4.
User
PRESETS**

	Initialize preset	P1	P2	P3	P4
SETUP					
SETTINGS					
INPUT	digital				
PASSWORD	1234				
LOCK	off				
OUT METER	dBFS				
DEVICE NAME	Device mp7	SETTINGS are not saved in the preset!!!			
CAN ID	00				
TALLY 1-8	off				
GPI 1-8	off				
SYNC	INT 48				

PARAMETER						
GAIN		0.0				
STEREO		on				
FILTER	30Hz	on				
	15kHz	on				
PREEMPHASIS	PRE MODE	off				
	PRE THRES	0.0				
PEAK-LIMITER	LIM THRESH	0.0				
	LIM PROG	uni				
MPX-LIMITER	MPX-POWER	off				

4.2 Operation via web interface

4.2.1. Operation via web interface

After the configuration of network and IP-address of your device you can operate the mpX7 easily via web browser. (See chapter B6 Network integration)

Just type the valid IP-address of your device into your web browser (http:// IP-address).

You will get the following page:

The screenshot displays the 'Jünger Web Configurator' interface in a Mozilla Firefox browser window. The browser's address bar shows the URL 'http://110.110.55.57/control.xml'. The page title is 'Jünger Web Configurator'. The interface is divided into two main sections: 'CONTROLLER LAN' and 'SETTINGS MPX7'. The 'SETTINGS MPX7' section is active, showing various parameters for the 'DEVICE MPX7'. The parameters include Gain (0.0 dB), Limiter, Peak Level (-9.0 dBFS), Processing (universal), MPX Limiter, Threshold (OFF dB), Pre-Emphasis, Ceiling (0.0 dB), and Mode (off). There are also several graphical meters: Input/Output (dBFS), Leveler (dB), MPX (dB), Expander (dB), and Limiter (dB). The 'DEVICE MPX7' section on the left shows 'MPX7' and 'MPX7 2 Channel Digital Audio Level Processor'. Two callout boxes are present: a grey one labeled 'web interface controller settings' pointing to the 'CONTROLLER LAN' tab, and a blue one labeled 'Device mpX7 settings' pointing to the 'SETTINGS MPX7' tab.

Device related settings / Parameters of the device are described in 4.1.3.

4.2.1. CONTROLLER LAN

The screenshot shows the Jünger Web Configurator interface in a Mozilla Firefox browser window. The page title is "Jünger Web Configurator". At the top, there are tabs for "CONTROLLER LAN" and "SETTINGS MPX7". The main navigation bar includes "SYSTEM CONFIG", "BACKUP / RESTORE", "SOFTWARE UPDATE", and "REBOOT CONTROLLER". The "SYSTEM CONFIG" tab is active, and the "Controller" section is selected in the left sidebar. The main content area is divided into several sections:

- DEVICE:** Fields for Device Name, Device Location, and System Contact. A "SET DEVICE INFORMATION" button is below.
- PASSWORDS:** A checkbox for "Password checking enabled". A dropdown menu for "Change password for" is set to "operator". Fields for "Password" and "Repeat password" are present. A "CHANGE PASSWORD" button is below.
- NETWORK:** Fields for IP Address (10.110.55.57), Netmask (255.255.0.0), and Gateway (10.110.0.1). A "CHANGE NETWORK CONFIGURATION" button is below.
- METERING:** Fields for UDP Port Range Start (49152) and UDP Port Range End (65535). A "CHANGE METERING CONFIGURATION" button is below.
- SERVICES:** Checkboxes for "Maintenance Interface via RPC" (unchecked) and "Telnet Server" (checked). A "CHANGE SERVICES CONFIGURATION" button is below.

System configuration

DEVICE	Change device name
PASSWORDS	Enable password protection for admin an operator
NETWORK	Change network configuration: IP-address, netmask, gateway
METERING	Set UPD Port range for Metering data
SERVICES	RPC interface activation / Telnet Server activation

Back up / restore

Using the backup function a whole mpx7-data set (settings and presets) can be saved as a html-file into a folder of your choice. You can use this file to restore all the parameters of your device at a later date or to load this data set into another device.

Software update

Controller image update

To update the software of the controller you just have to load the image-file (.img) and press “update”.

Module firmware single update

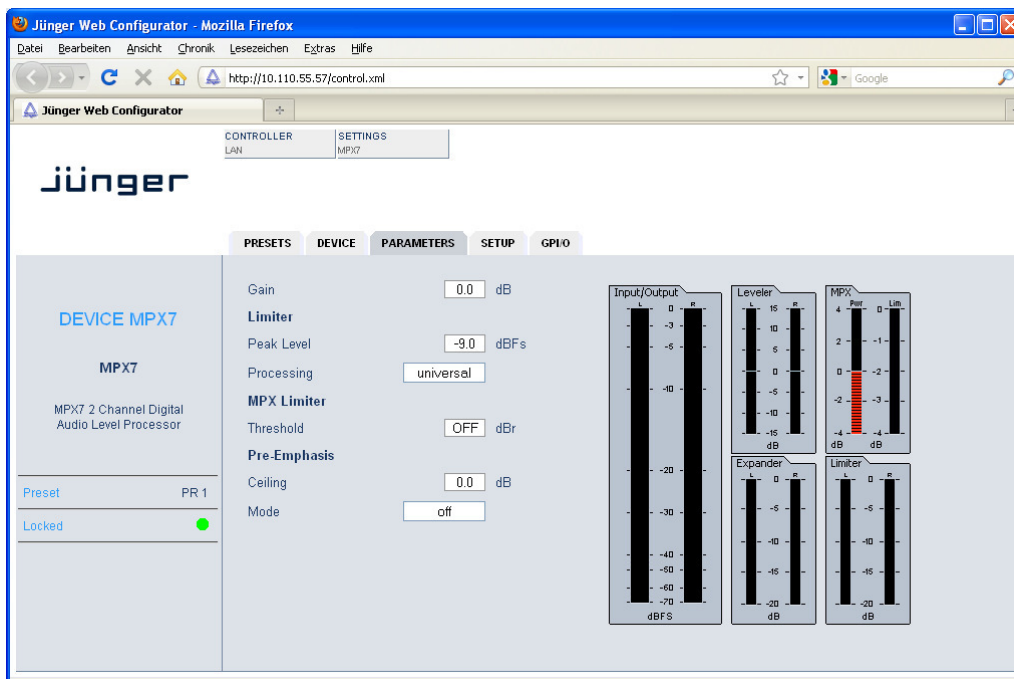
Please use the backup function of the device before updating the Controller or DSP as an initialization is needed after the update and all settings will get lost! By using the restore function you can easily get back to your former settings and parameters!

To update the Controller / DSP of the mpX7 you have to load the .bin (controller) or .can (DSP) – file and press “update”. Please Initialize the device after updating the Controller / DSP and load the backupfile via restore function to get back to your former settings and parameters.

Reboot controller

Rebooting the device activates the changes you have made to the network configuration. If you have changed the IP address of the device, you are not able to reach the web interface after the reboot. You have to use the new address, of course!

4.2.2. SETTINGS MPX7



Parameter Settings corresponding to front panel operation

BOOT DISPLAY AND TROUBLE SHOOTING



display	description
JUENGER AUDIO mpx7	Displays the device name
C: x.x D: x.x	Current controller version DSP-board version

display	Bedeutet	remedies
SYNC ERROR!	No valid sync	<ul style="list-style-type: none">■ Connect a valid SYNC-signal to the sync input■ Check the setting of the SYNC in the menu: setup -> configurate -> sync➤ INPUT: synchronisieren auf DIGITAL IN CH 1/2➤ EXT AES: synchronisieren auf SYNC AES/EBU➤ EXT VIDEO: synchronisieren auf SYNC VIDEO➤ EXT WCLK: synchronisieren auf word clock

5.1 BOOT DISPLAY

5.2 ERROR MESSAGES AND TROUBLE SHOOTING

5.3 INITIALIZING THE DEVICE

When you can't change the settings of the device for any reason, we advise to initialize the mpX7:

During initialization all storage areas and registers important for the program are loaded with the factory setup and the program is restarted.

Any button must be kept pressed to initialize the device during power-on of the device until the program has started. To the start of the program and at the completion of the displays (described in 6.1), the device is ready for operation with the factory setup.

After an initialization of the device, all user presets and adjustments are erased and/or overwritten by the factory setup!

TECHNICAL SPECIFICATIONS

sample rate 44.1/48 kHz
audio data format 24 bit

DIGITAL IN/OUT

AES/EBU

connector XLR, 110 balanced
input format AES professional, AES consumer
output format same as input format

channel status bits:

digital input -> digital output transparent
analog input -> digital output fixed channel status bits
(professional/48kHz sample frequency/2ch mode/24 bit audio)

ANALOG IN/OUT

ANALOG IN

Resolution 24bit
sample rate 44.1...48kHz
dynamic range 110dB (RMS)
114dB (A-weighted)
THD+N <0.002% @ max. input level
frequency response 20Hz...20kHz (FS=48kHz) (+/-0.5dB)
CMRR -100dB @ 50Hz
max. input level +22dBu @ 0dBFS
input impedance 10 kOhm, floating balanced
connector XLR, 1-screen, 2-live, 3-return

ANALOG OUT

Resolution 24bit
sample rate 44.1...48kHz
dynamic range 108dB (RMS)
110dB (A-weighted)
THD+N <0.002% @ max. input level
frequency response 20Hz...20kHz (FS=48kHz) (+/-0.5dB)
max. output level +22dBu @ 0dBFS
output impedance 30 Ohm, floating balanced
connector XLR, 1-screen, 2-live, 3-return



A 6

digital signal processing

digital in- / outputs

analog in- / outputs

**sync
in- / outputs**

SYNC IN

WCLK	connector	BNC, 75Ohm, coaxial
	level	TTL-level
	input format	Wordclock
AES/EBU	connector	BNC, 75 Ohm, coaxial
	level	0,5 ... 5 Vpp
	input format	AES professional, AES consumer
VIDEO	connector	BNC, 75 Ohm, coaxial
	level	0...1 Vpp
	input format	Blackburst or PAL/NTSC composite video

WCLK OUT

WCLK	connector	BNC, 10kOhm, coaxial
	level	TTL-level
	output format	Wordclock

remote control

REMOTE

serial remote interface	RS-232 in/out
connector	9 pin SUB-D female
serial remote interface	RS-422
connector	9 pin SUB-D male, optional TCP/IP

GPI parallel remote	level	opto coupler, 3..24V control voltage
	connector	15 pin SUB-D female
Tally Out	level	relais contact
	connector	25 pin SUB-D female

general

power consumption	appr. 15 VA
dimensions	19", 1 RU, 250 mm depth
weight	appr. 5 kg

WARRANTY AND SERVICE INFORMATION



JÜNGER AUDIO grants a two-year warranty on the

2-channel digital transmission processor mpX7

If the unit has to be serviced, please send it, ideally in the original box, to:

JÜNGER AUDIO - Studiotechnik GmbH

Justus-von-Liebig-Str. 7

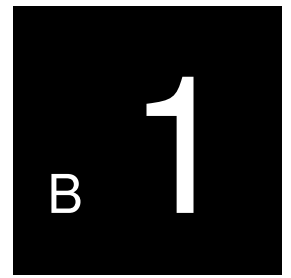
D - 12489 Berlin
GERMANY

Tel.: (*49) -30-677721-0
Fax.: (*49) -30-677721-46

B – APPLICATION NOTES

- 1. The Junger Audio Dynamics Processor Principle**
- 2. The Junger Audio Compressor & Expander Principle**
- 3. The Junger Audio Processing Presets**
- 4. Network Configuration for TCP/IP Operation**
- 5. FM-Transmission (d07)**
 - 5.1. General**
 - 5.2. MPX-Limiter**
 - 5.3. Pre-emphasis**
 - 5.4. terms and definitions**

THE JUNGER AUDIO DYNAMICS PROCESSOR PRINCIPLES



Changing the dynamic range of an audio signal is inherently a non-linear process. Unlike an ordinary line amp, the gain of a dynamic range processor is not constant – it varies with time depending on the specific control algorithm of the dynamics processor and the changing amplitude of the input signal. These variations in the gain, which represent the real control process, should take place without any bothersome side effects to the audio signal itself, effects such as pumping, signal distortion, sound coloration, or noise modulation. In other words, they should be inaudible.

The setting of the attack time parameter of a dynamics element effects how the unit will react to rapid amplitude changes in the audio signal. A long attack time leads to overshoots (and consequent distortion) because the system is not fast enough to reduce the gain. A short attack time minimizes the chance of overshoots, but the more rapid gain changes in such cases have audible side effects such as "clicks" and other modulation artifacts.

Traditional Compressor and Limiter Designs

Traditional compressor and limiter designs only have one control circuit with one attack time and one release time. They must be adjusted manually by the user to optimal settings for processing with as little disturbance as possible through a process of trial and error. A lot of experience and a lot of time is necessary to get acceptable results. These settings, once found, are only the right choice for a certain program signal and must be changed for other program types.

Multi-band designs

These units split the audio frequency spectrum into several frequency bands. The attack and release times are set independently for each frequency band, giving independent processing for each band. The problem with this multi-band approach comes when the outputs of each band's processor are combined together to produce the output audio. The spectral balance of this output signal is always different from the input. The balance of high, mid, and low frequencies is inherently disrupted, which is particularly objectionable when the signals are music, as in commercials, concerts, etc.

Multi-Loop designs

The Junger Audio Dynamics Processors work according to a [Multi-loop principle](#). The various loops each work over the entire frequency spectrum. They work in parallel, each with a different set of attack and release parameters. Each loop develops a control signal which is then summed with the controls from the other loops to produce a single gain control signal applied to one gain control element. Please see the figure below.

Look Ahead/Signal Delay

The digital implementation of the [Junger Multi-loop design](#) also permits a very short time delay (approx. 2ms) to be introduced in the audio signal path. It lets the gain changing elements “look ahead” and determine the correction needed. This is applied to the delayed signal just in time to control even the fastest transients. That is particularly important for the limiter, which provides a precisely levelled output signal absolutely free of overshoots (clipping).

When mixing together a delayed signal and a direct signal there may be cancellation of the signal waveform at some frequencies and re-inforcement of the waveform at other frequencies (comb filter effect). Corresponding 2ms delay of direct signals should therefore be carried out before mixing them with delayed processed signals.

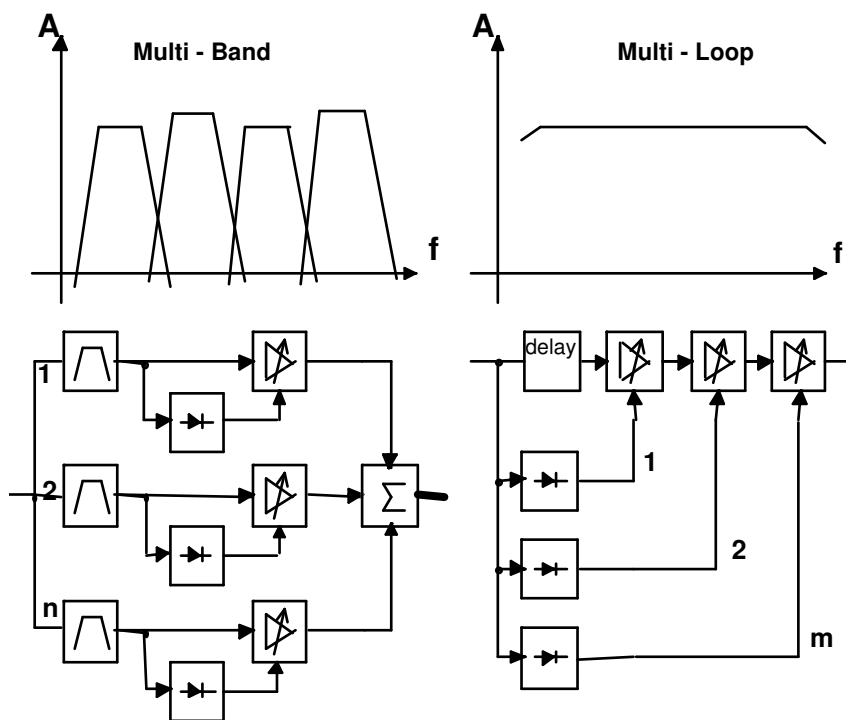
Adaptive Dynamic Range Control

The proprietary algorithms in the Junger System also allow the automatic adjustment of the attack and release times according to the evolution of the input signal over time. This is called Adaptive Dynamic Range Control. By monitoring the waveform of the incoming audio, the System can set relatively long attack times during steady-state signal conditions but very short attack times when there are impulsive transients.

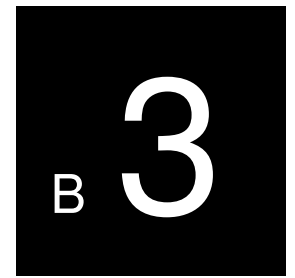
The Best Performance

The dynamic range processor principles developed by Junger Audio make it possible to realize dynamics processors (compressor, limiter, expander) with very high audio quality, without signal coloration, pumping or breathing, and without distortion and modulation products.

In short, they offer the best possible performance – inaudible dynamics control.



THE JUNGER AUDIO DYNAMICS PROCESSING PRESETS



For some of the control parameter it is possible to define a limited range of time constant values which are allowed for the adaptive dynamic range algorithms. Inside this range the time constants can be varied by the adaptive processing. Setting the range of time constant values may be sometimes useful, to get the best signal processing performance regarding specific program material.

Parameter related to the transient response of the control circuit are important for distortion-free processing. These time constants are always adaptive controlled without remarkable limitation of parameter range. This is caused by the presence of transient pulses in almost each kind of program material. The algorithm has to guarantee best reaction for fast increasing level of transient signals anytime even if classical music with slow dieing out characteristic is processed. In all cases the attack time of the limiter for very short transients is zero.

Especially the release time of the control circuit has more influence to the increase of loudness as any other parameter. The ranging of time constants in processing time groups reflects this fact. The range for processing time shows influence on release time parameter mostly.

The selection of the parameter PROCESS/PROGRAMM (limiter, compressor) changes the range of time constant values as follows:

PRO	Processing Time	Corresponds to Preset
0	2 ms to 0.2 sec	
1	5 ms to 0.5 sec	LIVE
2	10 ms to 0.8 sec	
3	15 ms to 1.2 sec	SPEECH
4	30 ms to 2.5 sec	POP
5	50 ms to 3.5 sec	
6	70 ms to 5.0 sec	UNIVERSAL
7	100 ms to 6.0 sec	
8	150 ms to 8.0 sec	CLASSIC
9	250 ms to 10.0 sec	

NETWORK INTEGRATION

of Jünger Audio devices



d07
mpx7
d06
Level Magic LT
C8000-modules via C8702 LAN Controller

To operate the Junger audio devices via web browser you have get an Ethernet connection DEVICE < - > PC. If you are not familiar with the network setup, please consult a network administrator for assistance and read ALL the manual carefully!

There are two ways to communicate with the device via ethernet:

- 1.** You can connect the device to the **LAN** your PC is integrated (if there is one existing already)
- 2.** You can connect the device directly to your PC using an **Ethernet crossover cable**.

In both cases network settings of the device or your PC or even both have to be changed and matched.

The default network configuration of the Jünger devices is:

IP Address: on a label at the Ethernet connector socket at the rear of the device
Netmask: 255.255.0.0.
Gateway: 10.110.0.1.

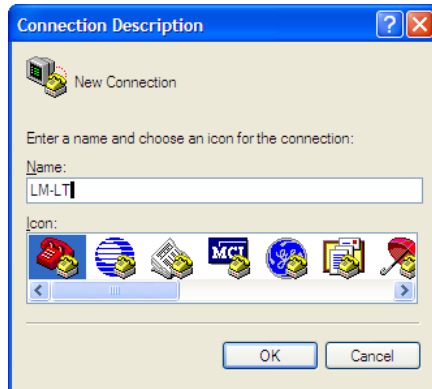
1. Integration into existing LAN

When you want to integrate the device into an existing LAN you have to change its IP-address, the (sub)network mask and the gateway. You will get valid settings from your network administrator.

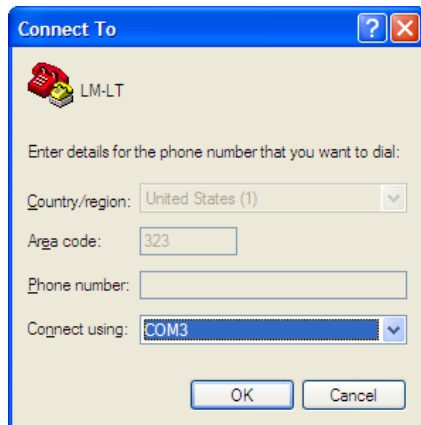
You can do that two ways:

- A** Connecting the device over a **serial cable** to your PC and change the network configuration with a terminal program (e.g. HyperTerminal included in Windows installation)
- B** Disconnect your PC from your LAN (physically), match your PC's network setup to the setup of the device for getting access to the device via **Ethernet crossover cable**, change the device's network configuration via Ethernet crossover cable. Then change again your PC's configuration and connect both your PC and the device to the LAN.

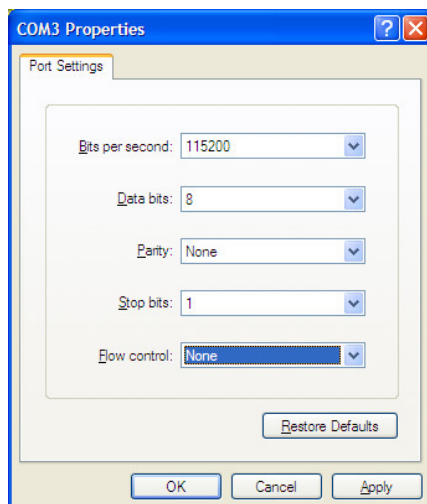
A) Connect the device over a 9 pin serial cable (connected 1 to 1) to your PC. Start your terminal program (e.g. Start -> Programs -> Accessoires -> Communications -> HyperTerminal).



Enter a name of your choice and press OK

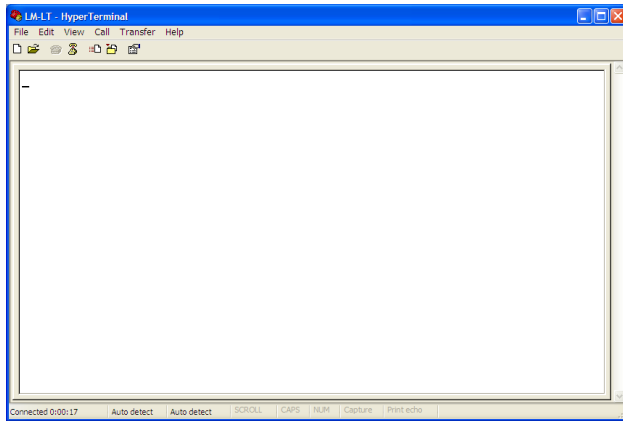


Choose the connection port you are working with and press OK

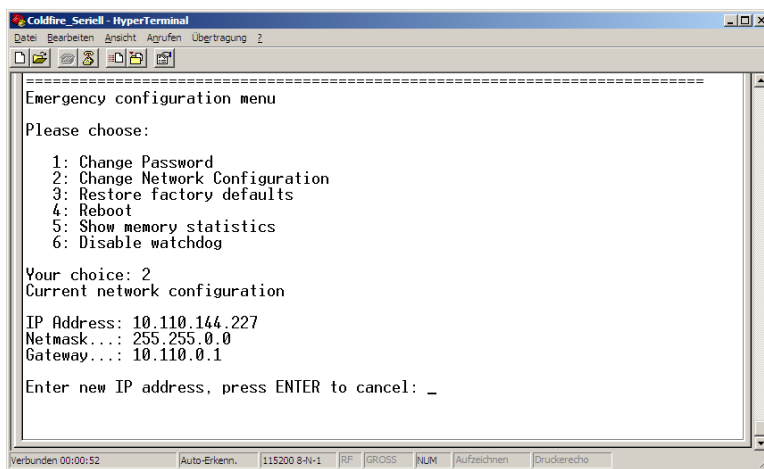


Set the COM settings as they are shown in the window above and press OK.

You will get to the Hyper terminal window:



Press ENTER and you will get the following information of the device:

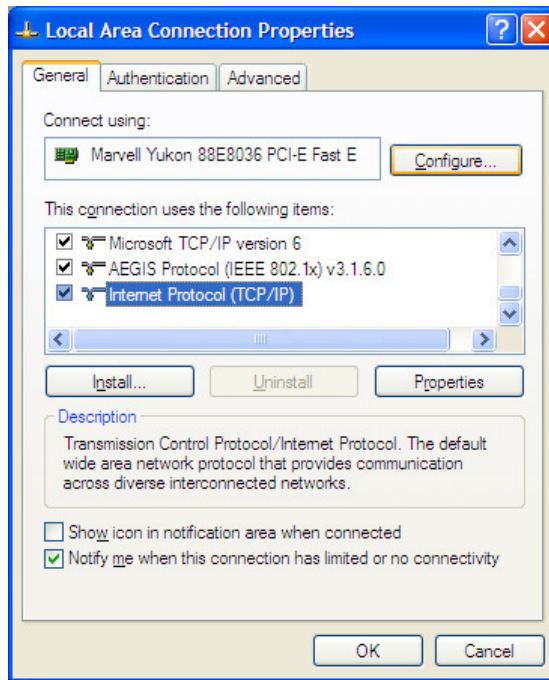


Now you can change the network configuration so that it fits into your LAN.

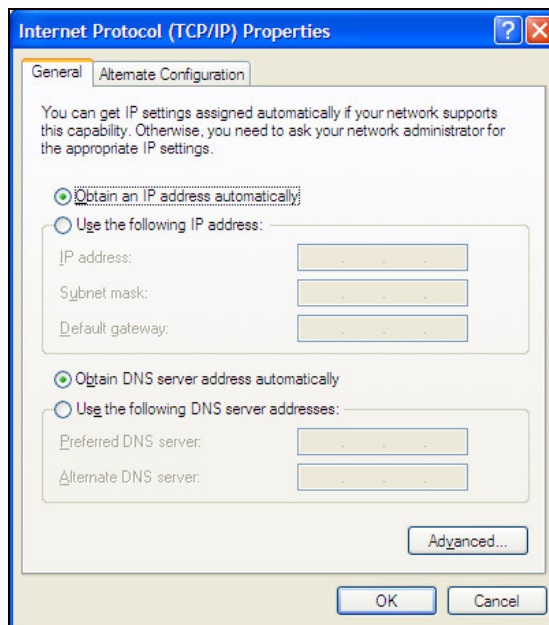
You might have changed the IP-address of the device, so please renew the label at the rear of the device, otherwise it will cause confusion.

When you ever initialize the device the default IP-address and network configuration will be active again. In case of need you can read the default IP-address always on the controller in the device!

B) You can also change the IP address of the device over Ethernet connection. Disconnect your PC from the LAN, connect it to the device directly via Ethernet crossover cable (not connected 1 to 1, but 1 to 8 etc...). Change the network configuration of your PC (**write down the current settings, you need them later to reconnect to your LAN!**) via "Local Area Connection Properties" (Windows: Start -> Settings -> Network connections -> Local Area Connections)



Scroll in the list and choose Internet Protocol (TCP/IP).
Make sure that the 'check box' for this item is checked, and then click on PROPERTIES.



In this example, the Ethernet TCP/IP is set to 'Obtain an IP address automatically.'

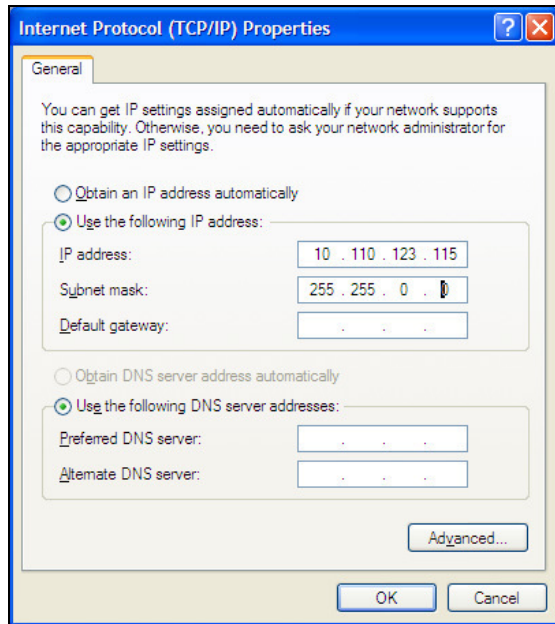
If, in your case, it is set to
'Use the following IP address,'
 jot down the current settings on a piece of paper
(IP address, Subnet Mask, and Default gateway, if used).
You will need them later to restore the IP address of the PC to what it is required
to work on your LAN.

Then change the settings in order to be able to communicate with the device. You have to choose an IP-address "near" to that of the device.

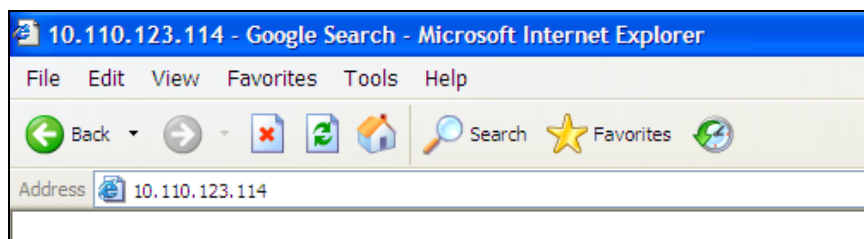
So if the settings of the device are e.g.

IP Address: 10.110.123.114
Netmask: 255.255.0.0.
Gateway: 10.110.0.1.

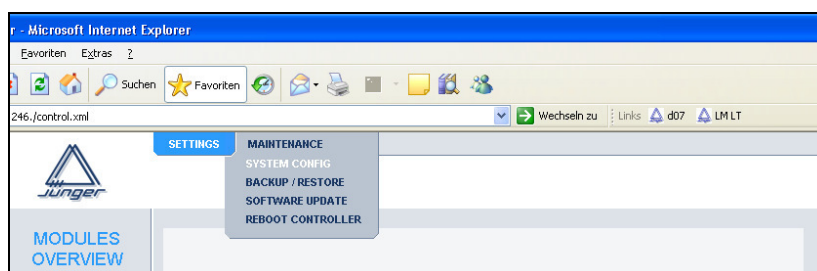
You have to take **10.110.123.115** as IP-address (or something near to the device's address, only 10.110.123. have to be the same!) and the same netmask. The gateway is not important when you are using an Ethernet crossover cable.



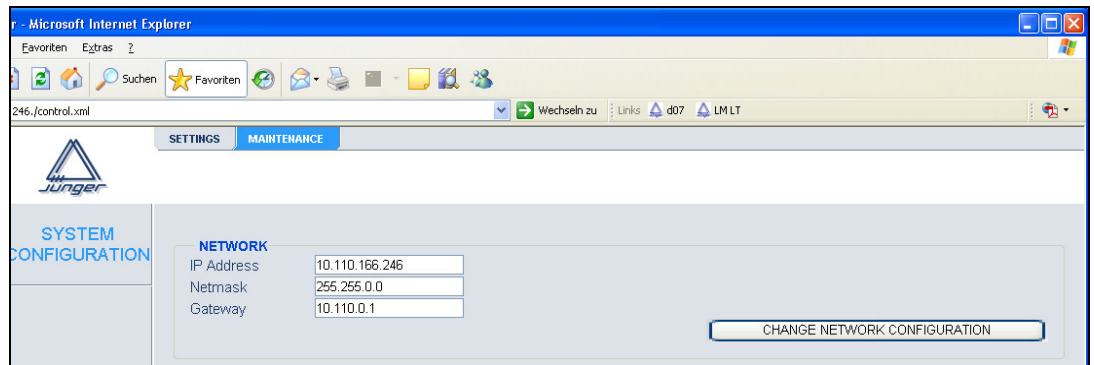
When you have changed the settings press OK. Now you will be able to communicate from PC to device via web browser (e.g. internet explorer) with an Ethernet crossover cable. Just type in the device's IP-address into your browser:



Then you will come to the modules web page:



Under MAINTENACE -> SYSTEM CONFIGURATION you will be able to change the device's network configuration according to the settings of the LAN you want to use.



After having changed the settings click CHANGE NETWORK CONFIGURATION and after that REBOOT THE CONTROLLER (Maintenance -> Reboot Controller).

Rebooting the device activates the changes you have made to the network configuration. If you changed the IP address of the device, you may not be able to reach the web interface after the reboot.

Now you have to change the settings of your PC network configuration again and connect both the PC and the device to the LAN you want to use. Then you will be able to communicate with the device over web browser via the chosen IP-address.

2. Connection via Ethernet crossover cable

When you want to communicate with the device via Ethernet crossover cable you can

C change your PC network settings and match them to those of the device

OR

D keep your PC network settings and change the ones of your device.

C) to change the PC network settings please refer to **1.B**. Follow the instructions till you get to the modules web page. And you are done!

D) if you want to keep the PC network settings you can either match the device's configuration via serial connection (see **1.A**) or you have to do the procedure explained in **1.B**. After having done the reset of the PC's network configuration you will be able to communicate with the device via Ethernet crossover cable.

FM-TRANSMISSION – mpX7



There are two important parameters for FM-Transmission

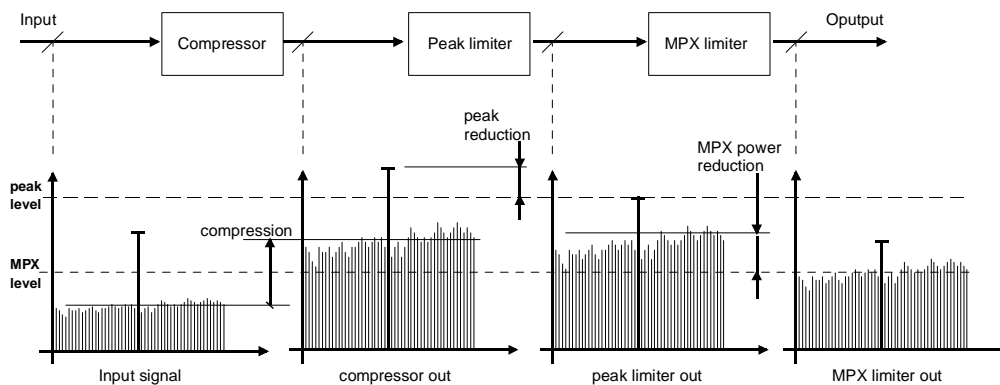
- The frequency deviation, determined by the peak level of the signal
- The MPX-Power, determined by the energy of the signal

International standards regulate the maximum values that have to be kept tight so that neighbouring transmitters will not be disturbed.

- Frequency deviation $\pm 75\text{kHz}$
- MPX-Power 0 dBr

The job of the mpX7 processor is standard compliance controlling of FM signal energy within permissible peak deviation.

The compression of the program signal causes an increase of the signal energy and, therefore, more loudness, but also more modulation power (MPX power). Too much compression will cause the permissible value of the multiplex power to be exceeded and the MPX limiter must reduce the total signal. As a consequence, the peak levels as well as the average levels are reduced, leading to a reduced loudness, as outlined below :



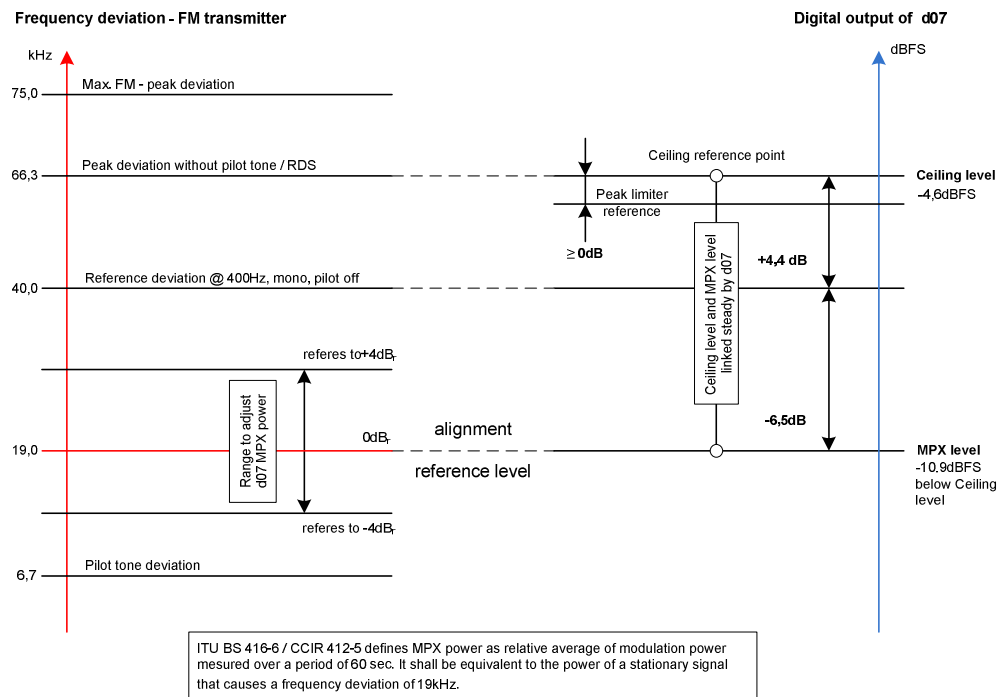
It is necessary to break up this “vicious circle” by optimal setting of GAIN and compression. The optimization of parameters should be done in a way that neither the peak limiter nor the MPX-limiter permanently show GAIN-REDUCTION. The program signal limitation should only occur briefly in order not to deprive it of all dynamic properties. The average modulation power can only be optimized by tweaking linear GAIN and the COMPRESSOR as well.

5.1. General

5.2. MPX-Limiter

Level diagramm

For alignment of the mpx7 it is important to consider the level diagram of the overall transmission chain (see below):



Peak Level

The ceiling level determines the maximum output level of the mpx7. This value is the most important setting parameter. It serves at the same time as the reference point for the MPX limiter and the adaptive pre-emphasis.

An MPX level of 0dB lies 11.1 dB below the limitation point of the limiter of the mpx7 and is fixed to it. This value is given by the relation of multiplex power level of 0dB (19kHz frequency deviation) to peak level (75kHz frequency deviation). For special applications the MPX level can be changed by + 4dB respectively.

Operation Level

The operating level in standard studio environment is not the peak level but the nominal level of +6dBu e.g. (analog) or -9dBFS (digital). This level will also be used to line up the FM transmitter and shall cause a nominal modulation deviation of +40kHz. The headroom of 4.6dB left to the peak level (peak deviation respectively) can be exploited for temporary signal peaks or for the pre-emphasis of higher signal frequencies.

MPX-Limiter Setup hints

With a given nominal level the threshold of the peak limiter may not exceed this nominal level by more than +4.6dB because otherwise the peak frequency deviation level will be exceeded. Therefore the transmission path must be aligned in a way that the nominal output level of the mpx7 will generate a signal at the output of a MPX-encoder that causes a deviation of 40kHz. Afterwards the peak limiter of the mpx7 must be set so that the peak deviation is limited to +75kHz.

To enhance the signal to noise ratio for FM transmission, Pre-Emphasis on the transmission end and De-Emphases on the receiving end is used. Higher frequency signal components are raised following a standardized filter curve and leads to an increased drive of the transmitter. This level pull up must be considered for the limitation of peak levels.

In the mpx7 the signal reaches a dynamic low path filter **after** a broad band limiter. The cut-off frequency of this high shelf filter is controlled adaptive and time depending. The attenuation of the filter for high signal components is controlled in a way that it compensates exactly for the increase of high frequencies by Pre-emphasis on the transmitting end. This alteration of the frequency response is only effective temporarily and will practically not be recognizable for normal program material because the processing time is below the integration time of the human ear.

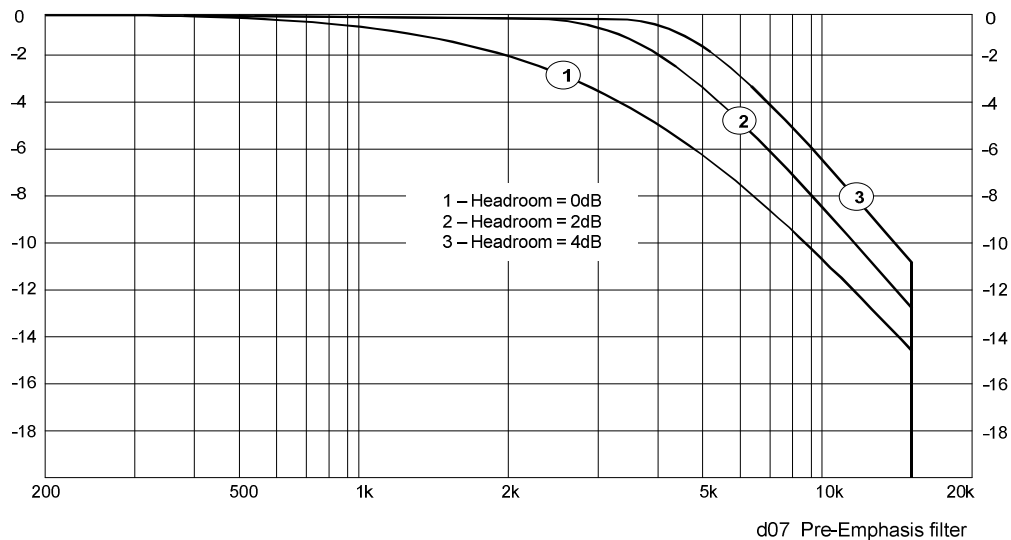
The threshold of the limiter can now be set in a way that maximum deviation is achieved for low frequencies. Higher frequency components will be reduced if necessary and do not cause an overshooting of the peak deviation.

If the program material has a lot of high frequency components the activity of the adaptive filter is of course more frequent and will eventually be audible.

If the threshold of the peak limiter is not set to maximum but some dB's below the resulting headroom can be used for higher frequency components.

By changing the limiter reference level, the operating point for the dynamic filter will be set. The curves below show how the cut-off frequency of the dynamic filter varies depending on a given headroom.

Headroom = Ceiling – Limiter peak level



Due to the different adjustable thresholds for peak limiter and adaptive pre-emphasis, an optimisation in regard to maximum level and sound balance can be achieved. This optimisation should also be done under consideration of the multiplex power because higher frequency components caused by a level increase on the transmitter side will make a higher contribution to the overall power.

5.3. Pre-emphasis

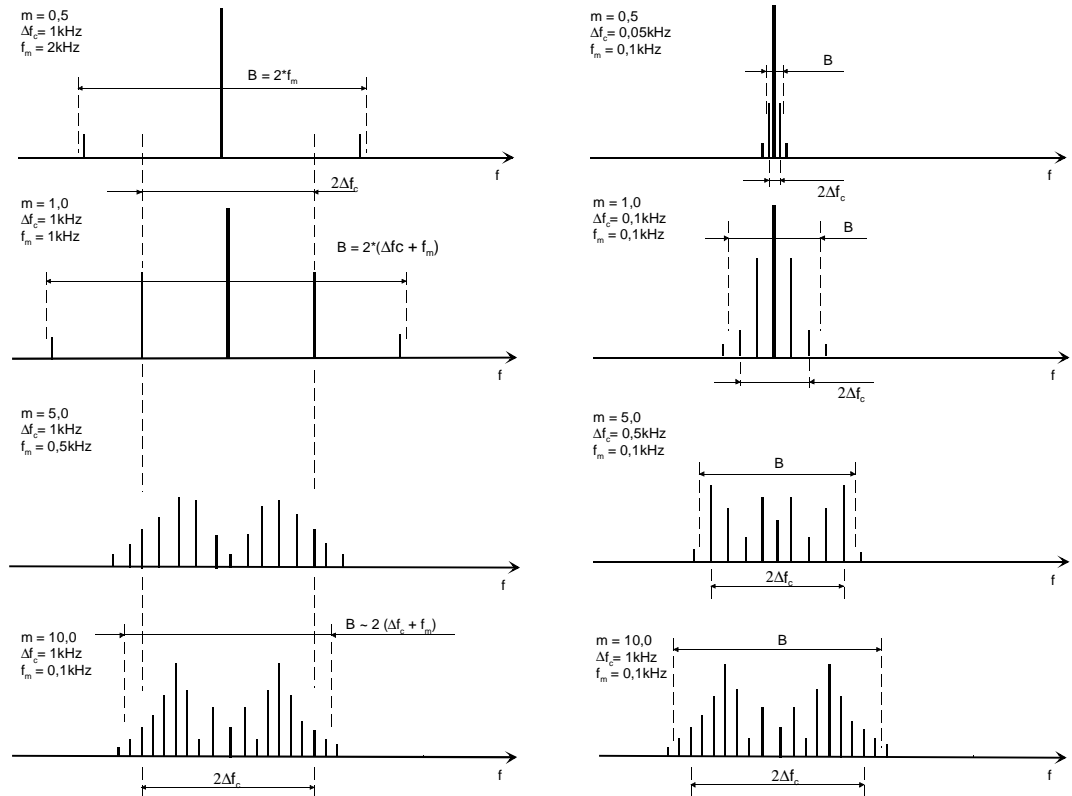
Pre-emphasis Threshold

Pre-emphasis Set up hint

5.4. Terms and definitions

Frequency modulation

The sketch below shows the principal influence of the modulation index $m = \Delta f_c / f_m$ to the spectrum of an FM signal. On the left side the frequency deviation Δf_c (amplitude of the modulating signal) is constant but the modulating frequency f_m changes. On the right hand the modulating frequency f_m is constant but the frequency deviation Δf_c is changing :



You can show that a bandwidth of approx $B \sim 2 \cdot (\Delta f_c(\max) + f_m(\max))$ is needed for FM modulation for high rejection of high frequency signals. With a maximum frequency deviation of 75kHz and 15kHz cut-off-frequency of the modulating signal B will be $\sim 180 \text{ kHz}$. Based on this fact the planning of transmitter positions and power takes place for area-wide feed. To prevent disturbance in adjacent channels the maintaining of the frequency deviation needs the highest attention.

Frequency deviation Δf_c

Value of deviation of the mean frequency from the transmitting frequency of a FM transmitter caused by the amplitude of the modulating signal.

Peak Deviation $\Delta f_c(\max)$

Maximum frequency deviation allowed for an FM transmitter. Defined by the ITU to 75kHz

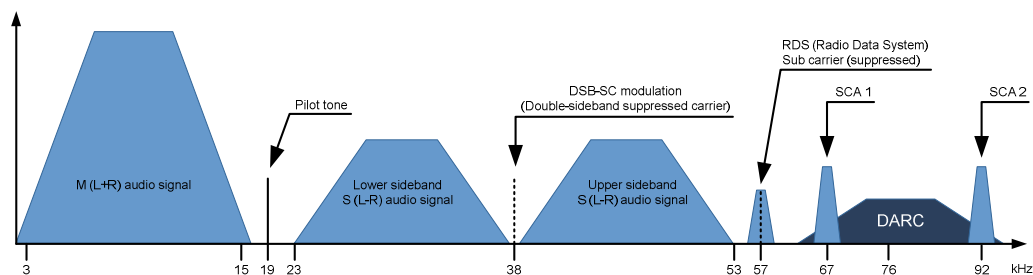
Pre-Emphasis

Increase of high frequencies to enhance the signal to noise ratio for FM transmission equals to a time constant of a high pass filter of 50µs in Europe and 75µs in America. It will be laterally reversed at the receiver end. This value does not comply with today's spectrum of audio signals. But it is not possible to change it because of the innumerable receivers. Therefore modern audio signals may easily over drive an FM transmitter, causing nasty interferences.

Adaptive Pre-Emphasis

Function of the mp7 that makes it possible to dynamically accommodate the level of an audio signal to the high frequency boost of an FM transmitter. The effect is that over driving by high frequency signal components in critical programs will be avoided (s.a. pre-emphasis).

MPX-Spektrum



MPX-power

Overall power of the Multiplex signal from the sum of components of the MPX spectrum :

Monaural signal	$(M=L+R)/2$	30Hz	to	15kHz	base band
Auxiliary carrier		19kHz	approx	9%	of overall power
Double side band suppressed		23kHz	to	38kHz	lower side band
Carrier modulation	$(S=L-R)/2$	38kHz	to	53kHz	upper side band
RDS signal					
DARC signal					

mpx7



Jünger Audio GmbH
Justus-von-Liebig-Straße 7
12489 Berlin
Germany



phone: +49 30 6777 21 0

fax: +49 30 6777 21 46

info@jungeraudio.com

www.jungeraudio.com