stage accompany

Stage Accompany

PPE 2410

Programmable

Parametric

Equaliser

User Manual

Software Version 1.2

stage accompany

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This manual is designed to provide information about the PPE 2410 equaliser. Every effort has been made to make this manual complete and as accurate as possible. But no warranty of suitability, purpose, or fitness is implied. The information is provided on an "as-is" basis. Stage Accompany shall have neither liability nor responsibility to any person or entity with respect to any loss or damages in connection with or arising from the information contained in this manual.

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1 Quick Introduction to the PPE 2410

If you have to start using the PPE straight away and do not have time to read the complete manual, make sure that you at least read the following:

- Ensure to have a reliable power source.
- Connect the PPE to the signal source via the <AUDIO IN> inputs. Connect it to other units via the <AUDIO OUT> outputs.
- If desired, connect the PPE via the <SAnet-IN> and <SAnet-OUT> to other SAnet compatible equipment.
- Switch the PPE on using the <POWER ON/OFF> switch.
- Adjust the level of the incoming signal (<INPUT LEVEL>) using the <UP> and <DOWN> keys. By pressing the <UP> and <DOWN> keys simultaneously, you can choose an extra input signal amplification of +10 dB or +20 dB.
- Two seconds after depressing the keys, the amplification factor will appear in the display. By keeping the keys depressed, the setting will cycle from 0 dB to +10 dB, then +20 dB, and then back to 0 dB. When the desired value appears, releas the keys.
- Adjust the level of the outgoing signal (<OUTPUT LEVEL>) using the <UP> and <DOWN> keys.
- Select the frequency band in which you want to make sound corrections using one of the four band selection keys (located above the <BYPASS> keys). If the <DUAL TRACK> key is activated (yellow LED indicator above the switch is on), both channels of the PPE will be adjusted simultaneously.

- Adjust the "center frequency" (center frequency: see paragraph 4.2.2 for further details) in your chosen band using the <FREQUENCY> <UP>/<DOWN> keys. The chosen center frequency will be shown in the <FREQUENCY> display.

- Set the bandwidth to be adjusted (see paragraph 4.2.2 for further details) using the <Q-FACTOR> <UP>/<DOWN> keys. A low Q-factor (e.g. 0.3) gives a wide adjustment range; a high Q-factor (e.g. 15.0) gives a narrow adjustment range.

- Set the amount of amplification or attenuation using the <BOOST/CUT> <UP>/<DOWN> keys.

- If the PPE cuts out during use, or is being switched off, the inputs will be connected directly through to the outputs. The electronic circuit is then lo longer active, but the incoming signal will be directly fed to the output. The unit is then in the so-called bypass mode. If the PPE is switched on again, the <OUTPUT LEVEL> always starts from OFF. After approximately 2 seconds, the PPE will automatically switch the output signal back to the last selected value via a gradual fade-in.

- If ground hum is present, it can be corrected using the <INPUT GROUND> and/or <OUTPUT GROUND> switches, the <SYSTEM GROUND> switch or the <SAnet GROUND> switch. These switches are located on the rear of the PPE.

- The use of presets is not directly necessary for the functioning of the PPE. For further information, see Chapter 4.

2 General Description

The facilities of the PPE 2410 can be divided into four main functions:

- Equaliser function
- "Leveller" function
- MIDI interface
- SAnet interface

The various functions will be described briefly in this chapter.

2.1 The Equaliser

Although the functioning of a parametric equaliser at first appears more complicated than that of a graphic equaliser, the clearly arranged front panel and range of functions available ensure that the PPE is easy to use. A parametric equaliser has the great advantage that sound corrections can be made much more accurately than with a graphic equaliser. Moreover, the chosen settings are displayed much more clearly by the PPE.

The Stage Accompany PPE 2410 is a 2-channel, 4-band analog, digitally controlled, programmable parametric equaliser. Both channels of the PPE can be programmed completely different. With the dual track function, the operation of both channels can be coupled, so that changes to the settings effect both channels.

Each channel has four bands or filter sections, each with its own bypass facility, band select key, and clip indication. The chosen settings can be stored in one of the 64 memory locations.

The amplification of the input signal can be set to 0 dB (unity gain), +10 dB or +20 dB. The PPE can therefore also be used as an interface to adjust home-recording and hi-fi equipment, which mostly works at a level of -10 dBm or -20 dBm, to professional equipment, which works at a level of 0 dBm or +4 dBm.

2.2 "Leveller" Function

The PPE 2410 features a "leveller" function. This function can be used to limit the sound level for specific applications. For further information, see paragraph 7.3.

2.3 MIDI Interface

The PPE has MIDI IN, OUT and THRU connections. Program change commands can be given by an external MIDI controller (synthesizer, sequencer, etc.). In this case, the 64 memory locations of the PPE can be randomly coupled to the 128 program numbers (0 - 127) of the external MIDI controller. Furthermore, the channel number can be freely set between 1 and 16.

2.4 SAnet Interface

In addition to MIDI, the PPE 2410 has the SAnet interface, by which the unit can be controlled remotely. Equipment with the SAnet interface (PPE, Blue Box, PPA) can be connected to a personal computer, allowing remote control of all the equipment. All parameters of the individual units can be programmed and monitored from the PC. Furthermore, several units (such as multiple PPE 2410s) can be grouped together and operated groupwise. The maximum distance using the correct cabling is 500 meters.

SAnet is a data communication system: data can be transmitted and received using a single line. This is in contrast to MIDI, which is a synchronization system. MIDI has separate in, out and thru connections, and cabling in which communication occurs in one direction only.

NOTE: the PPE 2410 functions perfectly well without a PC and/or coupling with other equipment via SAnet. The SAnet interface is a standard provision that allows the possibility of remote control, but that does not have to be used.

For more information about operating PPEs using a PC via SAnet, contact your Stage Accompany dealer.

3 Connections

3.1 Mains Voltage and Fuses

Always be sure that you use a correctly grounded power supply. The PPE has an adjustable voltage input and is also provided with a filter. This filter reduces possible noise from the mains supply.

Before connecting the PPE to the power supply, ensure that the value on the voltage selector switch corresponds with the actual voltage of the power supply. The switch, which is provided with a fuse, can be set to 110 V, 220 V or 240 V.

NOTE: Only use the switch or fuse-holder if the PPE is disconnected from the power supply!

3.2 Audio Connections

The <INPUT> and <OUTPUT> connectors are located on the rear of the PPE and are of the standard 3-pin XLR type. The input impedance is 24 kOhms balanced and 30 kOhms unbalanced. The output impedance is 25 Ohms balanced and 50 Ohms unbalanced. The output stage is protected against short circuiting.

The balanced <INPUT> and <OUTPUT> XLR connectors are wired as follows:

pin 1 = ground (screening)
pin 2 = in phase (+ or "hot")
pin 3 = out phase (- or "cold")

The PPE automatically indicates whether a balanced or unbalanced connection has been made. If you want to input an unbalanced signal, connect the wiring as follows:

pin 1 = ground (screening)
pin 2 = in phase (+ or "hot")
pin 3 = connected to pin 1

An unbalanced signal can be supplied to the <INPUT>, while the rest of the signal path can be balanced. In this case, the PPE automatically converts the signal from unbalanced IN to balanced OUT.

If the PPE is not switched On, the inputs will be connected through directly to the outputs, in which case the whole electronic circuit will be bypassed. The signal path in which the PPE is connected thus remains intact if the PPE is switched off. If, in case of a malfunction, the PPE can unfortunately no longer be used, simply switch it off using the <POWER ON/OFF> switch and it will have no further effect on the signal.

3.3 MIDI Connections

MIDI connectors are of the 5-pin DIN type. MIDI leads are standard DIN leads of the sort that can be purchased in for example hi-fi shops. For MIDI applications, only pin 4, pin 5 and the screening (pin 2) are used. If you do not use standard DIN leads, first check that the connections are correct.

Connect the <MIDI IN> connector of the PPE with the <MIDI OUT> or <MIDI THRU> of your MIDI controller, synthesizer, etc. The <MIDI OUT> and/or <MIDI THRU> connections may be connected to the <MIDI IN> connection of another unit.

3.4 SAnet Connections

SAnet uses a symmetrical, two-wire connection. The advantage of a symmetrical connection is that "common mode" interference (= external interference such as power-up peaks from other equipment, radio interference and interference from light dimmers) has virtually no influence on the signal.

You are advised to use two-wire coaxial cable (known as "twinax") as connecting cable. If the system is not likely to be used under extreme circumstances, well screened microphone cable may suffice. The maximum cable length is approximately 500 m when using twinax and 250 m when using screened microphone cable.

The required connector is of the 4-pin XLR type, such as the Neutrik NC-4-FC (female) or NC-4-FRC (angled female) and the NC-4-MC (male) or NC-4-MRC (angled male). These connectors are mechanically very robust, currently popular and readily available at your local suppliers.

The XLR connectors of the SAnet connectors are wired as follows:

Pin 1 = ground (screening)
Pin 2 = +5 V for (future use of remote control)
Pin 3 = SAnet in phase (+ or "hot")
Pin 4 = SAnet out phase (- or "hot")

A maximum of 250 units such as PPE 2410s, Blue Boxes, PPA 1200 amplifiers and/or other units with an SAnet interface can be connected simultaneously to an SAnet.

SAnet and other communication systems such as MIDI are NOT compatible. Therefore, never make a connection between SAnet and MIDI equipment. If you do, it can result in serious damage to your equipment.

NOTE: All units that are part of a sound system can be connected with each other via SAnet. No differentiation is made between peripheral apparatus (PPE), amplifiers (PPA) and integrated systems (Blue Box). The concept of "left" and "right" in a stereo set-up is also of no importance. SAnet is a communication network, functioning apart from the audio signal route and therefore has no influence on the sound and/or stereo image.The SAnet connection is a symmetrical, two-wire connection.

3.5 Ground Loops

To prevent ground loops, every input and output connector is provided with a <GROUNDLIFT> switch. Using this switch, the connection between the signal ground and system ground can be broken (lifted). Using the <SYSTEM GROUNDLIFT> switch, the connection between the system ground and mains ground can be broken. Finally, using the <SAnet GROUNDLIFT> switch, the connection between the SAnet ground and system ground can be broken. The diagram on the next page illustrates the various ground connections.

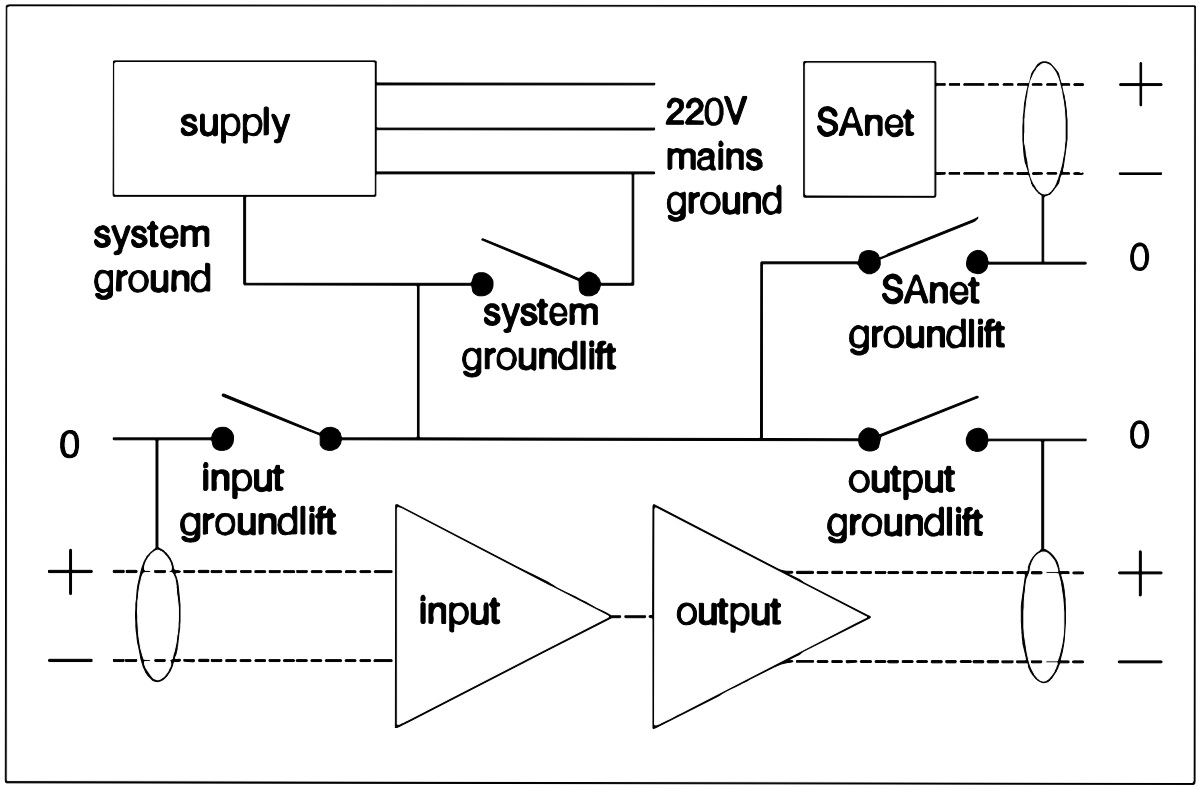


Figure 3-1 The various ground connections of the PPE 2410.

4 Operation

After connecting to a power supply of the correct rating, switch on the PPE with the <POWER ON/OFF> switch. The first time that you use the PPE, the displays will read the following default settings:

OFF	0.0	20	1.0	OFF	1 – 1

- The eq control circuit is activated. This is indicated by the <EQ IN/OUT> LED indicator.

- The <INPUT LEVEL> and <OUTPUT LEVEL> displays reads "OFF".

- The <PEAK HOLD> indication of the <INPUT LEVEL> and <OUTPUT LEVEL> LED bars do not light up. The signal is displayed without holding the peaks.

- The four frequency bands are set neutrally. The equaliser display shows the settings of the lowest frequency band (the yellow LED of band 1 lights up) as follows:

  <BOOST/CUT>: 0 dB
  <FREQUENCY>: 20 Hz
  <Q-FACTOR>: 1.0

  The <CHANNEL 1> LED indicator by the <READOUT> section lights up to show that the display readings relate to channel 1.

- The <DUAL TRACK> indicator lights up to show that any changes made to the various parameters will be effected for both channel 1 and channel 2.

- The <PRESETS> display shows "1-1", which is the first memory location or preset. The 64 memory locations of the PPE are not provided with default settings at the factory. For further details, see paragraph 4.4.1.

The operation panel of the PPE is divided into four sections:

- Input section
- Equaliser section (sound control)
- Output section
- Memory section

The various sections are described in detail in the following sections.

4.1 Input Section

The input section of the PPE is illustrated in the following diagram.

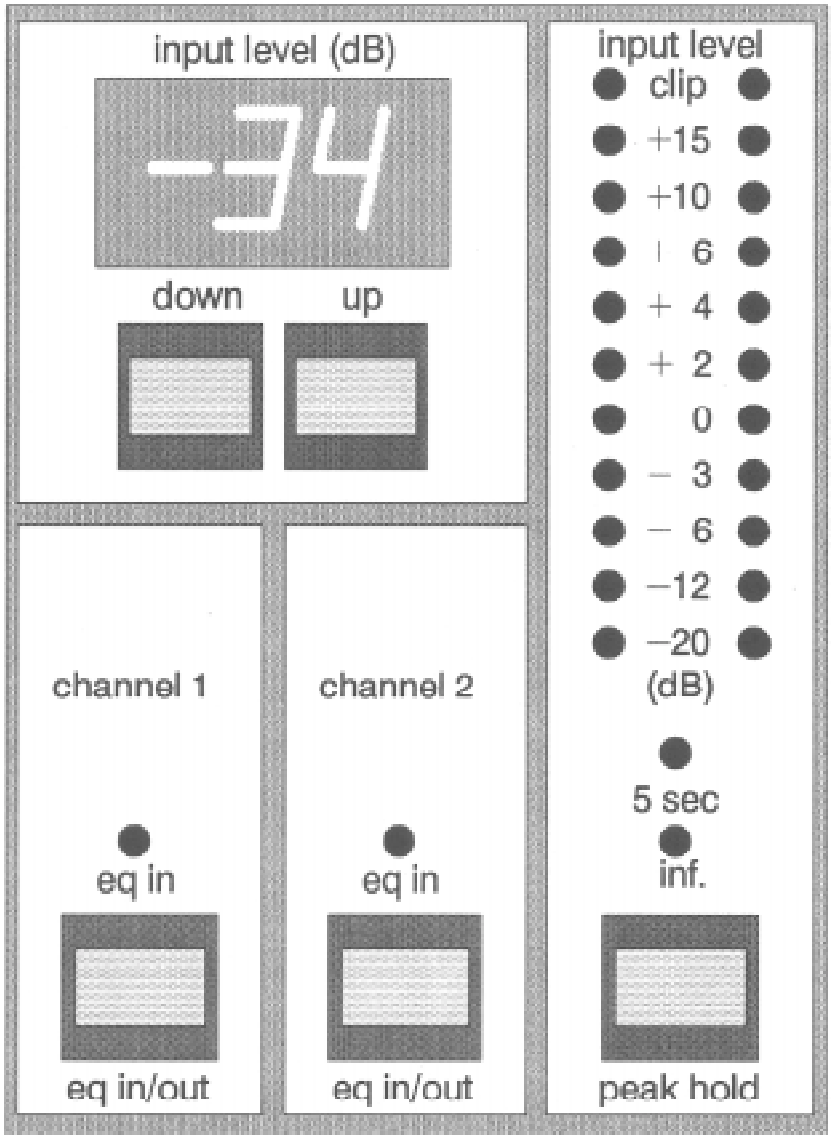


Figure 4-1 Input section of the PPE 2410.

The input section comprises three parts: the input level control (<INPUT LEVEL>), equaliser in/out switches (<EQ IN/OUT>) and the input level LED bars (<INPUT LEVEL>). The various parts of the input section are described in detail in the following sections.

4.1.1 EQ in/out

Using the <EQ IN/OUT> keys, the equaliser section can be switched on or off. The other settings are not affected by these keys. A quick comparison can be made between unprocessed sound (EQ OUT, LED out) and processed sound (EQ IN, LED on) using these keys.

4.1.2 Input Signal Level Control

The <INPUT LEVEL> display has a range of -60 dB (OFF) to 0 dB (completely open). The first time that you switch the PPE on, the input level switch will be OFF. Normally, it should be adjusted to 0 dB (completely open).

The level of the input signal can be increased in 1 dB steps by momentarily pressing the <UP> key. If you depress the <UP> key, the level of the input signal will be raised with increasing speed.

The level of the input signal can be decreased in 1 dB steps by momentarily pressing the <DOWN> key. If you depress the <DOWN> key, the level of the input signal will be decreased with increasing speed.

Because the input level control functions as a signal attenuator, the setting of the control is displayed as a negative value (-X dB).

4.1.3 Extra Input Signal Amplification

The PPE works at the professional level of 0 dBm. Semi-professional equipment (home-recording and hi-fi equipment, etc.), however, operates at a level of -10 dBm or -20 dBm. If the PPE were to be connected to such a piece of equipment, the input signal would be too small, resulting in too small an output signal and consequently an unfavorable signal to noise ratio.

To resolve this problem, the PPE is provided with an extra input signal amplification function of +10 dB or +20 dB. If the <INPUT LEVEL> <UP> and <DOWN> keys are pushed simultaneously, the <INPUT LEVEL> display will show:

input level: 0

This shows that the PPE currently has no extra input gain. If you keep both keys pressed, "10" will subsequently be displayed:

input level: 10

The input level will now be amplified with 10 dB. If you still keep both keys pressed, "20" will be displayed after one second:

input level: 20

The input level will now be amplified with 20 dB. If you still keep both keys pressed, "0" will again be displayed after one second. This indicates that the input signal is no longer being amplified (0 dB).

Before connecting other equipment to the PPE, check its operating level and adjust the PPE accordingly. Professional mixing consoles and peripheral equipment operate on a level of 0 dBm or +4 dBm. In this case, set the PPE to 0 dB extra input amplification.

For equipment operating at a working level of -10 dBm, set the PPE to 10 dB extra input amplification. For equipment operating at a level of -20 dBm, set the PPE to 20 dB extra input amplification. In this way, it is possible to connect for example a CD player directly to the input of the PPE, without an intervening mixing panel or pre-amplifier.

Always check that the PPE's extra input signal amplification is set correctly. If an input signal of 0 dBm or +4 dBm is amplified with +20 dB, the input stage will be overloaded, which will result in a distorted signal.

4.1.4 Input Signal "LED Bar" and "Peak Hold"

The level of the input signal is displayed on the 11-segment <INPUT LEVEL> LED bar. The range of the LED bar is -20 dBm to +15 dBm, divided into the following ten steps: -20, -12, -6, -3, 0, +2, +4, +6, +10 and +15 dBm. The eleventh LED is the <CLIP> indicator. If the <CLIP> indicator lights up, it means that the level of the input signal exceeds +20 dBm. In this case, check the following:

- The extra input signal amplification must be set correctly (0, 10, 20). If this is not the case, reduce the setting to the correct value.

- If the PPE is being fed by a mixing console, the faders may be too far open, Adjust to the correct level.

In general, the best output signal/noise ratio is obtained with an input signal between 0 and +15 dBm. At this input signal level there is generally enough "headroom" available to process peaks without distortion. The desired output level can be set with the <OUTPUT LEVEL> control (see paragraph 4.3).

The LED bar gives the extreme values of the input signal and therefore has a peak characteristic. You can select a peak-hold indication of 5 seconds (LED next to <5 SEC> lights up) or infinity (LED next to <INF> lights up). The peak-hold indication can also be switched off. In this case, both LEDs are out.

Select the desired setting using the <PEAK HOLD> key. After pressing this key, the LED indicator jumps from OFF to <5 SEC>, then to <INF> and subsequently back to OFF.

OFF: The peak-hold indication is inactive and the LED bar behaves solely as a peakmeter.

5 SEC: The highest LED that is lit indicates the highest measured level and remains lit for 5 seconds on this level. Subsequently it lights up for 5 seconds on the next highest level, etc. If, within the 5 seconds, a higher value is measured than the one currently indicated, then this new higher value will be held for 5 seconds.

INF: This means "infinite". The highest LED that is lit indicates the highest measured level and remains lit until a higher level is measured. In this way, you are informed about the highest observed signal level.

4.2 Equaliser Section

The equaliser section of the PPE is illustrated in the following diagram.

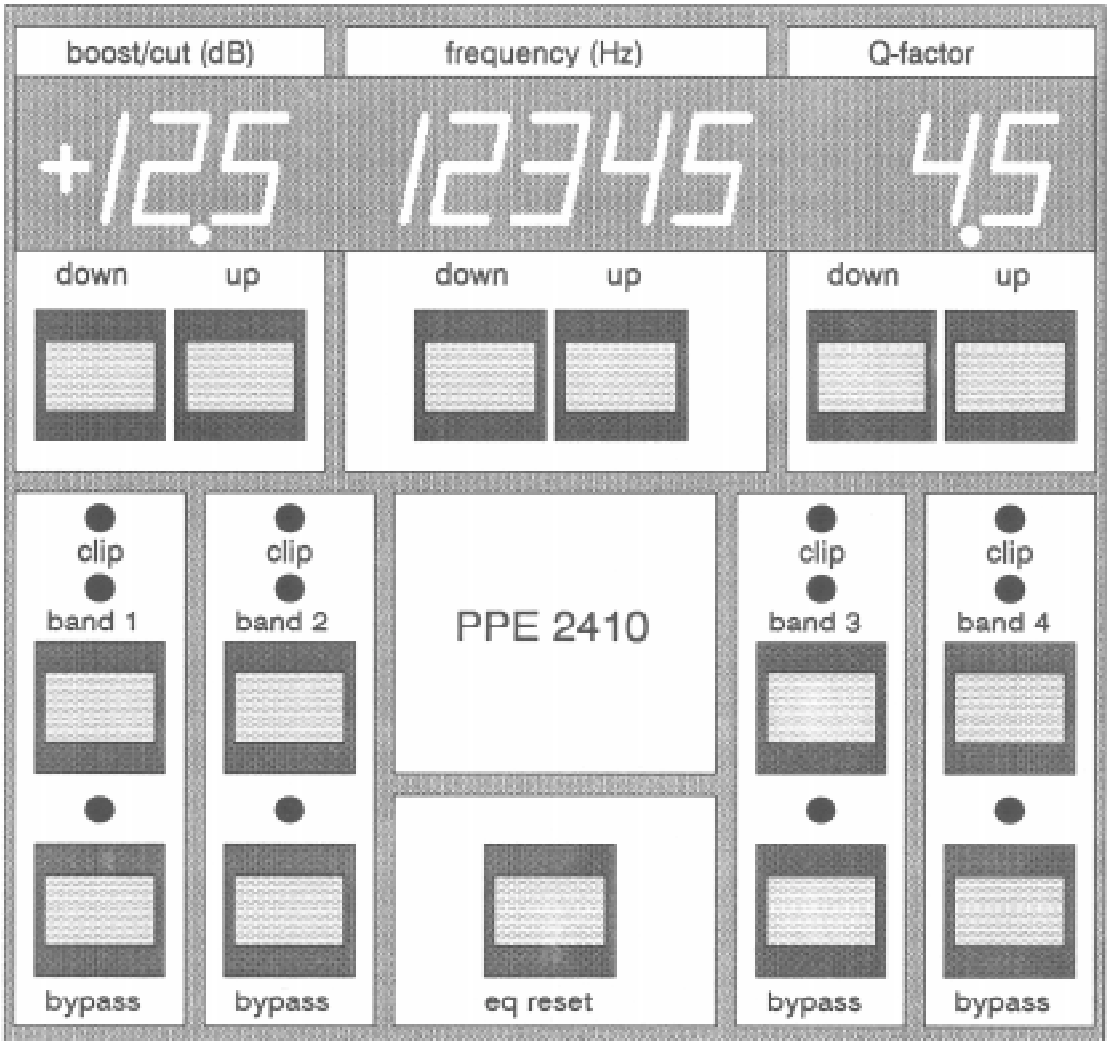


Figure 4-2 Equaliser section of the PPE 2410.

The equaliser section comprises three parts:

- parameter controls (<BOOST/CUT>, <FREQUENCY> and <Q-FACTOR>),
- band select/bypass (<BAND SELECT>)/(<BYPASS>)
- equaliser "reset" (<EQ RESET>) function.

4.2.1 Band Select Function

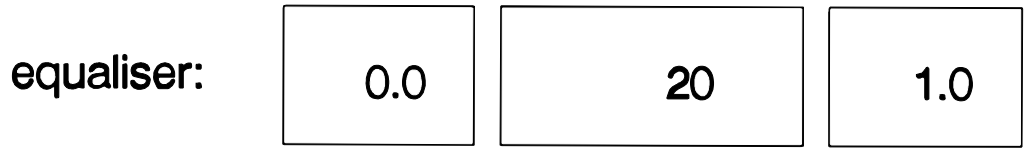
The PPE has four equaliser bands per channel. The frequency ranges of the bands are:

Band 1: 20 - 600 Hz
Band 2: 60 - 2000 Hz
Band 3: 200 - 8000 Hz
Band 4: 600 - 20000 Hz

To set the parameters for a specific band, press the relevant <BAND SELECT> key. The yellow LED for that band will light up and the parameters for that band (BOOST/CUT, FREQUENCY and Q-FACTOR) will be shown in the display.

4.2.2 Amplification/Attenuation, Frequency and Q-Factor

If you select band 1 the first time you use the PPE, the display will show the following default settings:



Using the <UP> an <DOWN> keys you can set the desired values. The ranges and step sizes of the various settings are:

BOOST/CUT:	Range	= -19.5 dB to +19.5 dB
	Step size	= 0.5 dB
FREQUENCY BAND 1:	Range	= 20 Hz to 600 Hz
	Step size	= 3 Hz
FREQUENCY BAND 2:	Range	= 60 Hz to 2000 Hz
	Step size	= 8 Hz
FREQUENCY BAND 3:	Range	= 200 Hz to 8000 Hz
	Step size	= 31 Hz

FREQUENCY BAND 4:	Range	= 600 Hz to 20000 Hz
	Step size	= 77 Hz
Q-FACTOR:	Range	= 0.3 to 15.0
	Step size	= quasi-logarithmic increasing

The values can be adjusted, step-by-step, using the <UP> and <DOWN> keys. You can also keep the keys depressed so that the values are run through sequentially.

Example:

Imagine you want to add a bit more "low end" to the sound: +3 dB at 50 Hz with a Q-factor of 0.7.
First select band 1. Then set the frequency using the <FREQUENCY> <UP> and <DOWN> keys. Adjust the central frequency until the equaliser display shows:

equaliser:	0.0	50	1.0

Then adjust the Q-factor using the <Q-FACTOR> <UP> and <DOWN> keys until the display shows:

equaliser:	0.0	50	0.7

Finally, adjust the amplification (boost/cut) using the <BOOST/CUT> <UP> and <DOWN> keys until the display shows:

equaliser:	+ 3.0	50	0.7

The settings used in this example will result in the following frequency characteristics (assuming that the other equaliser bands have not yet been set).

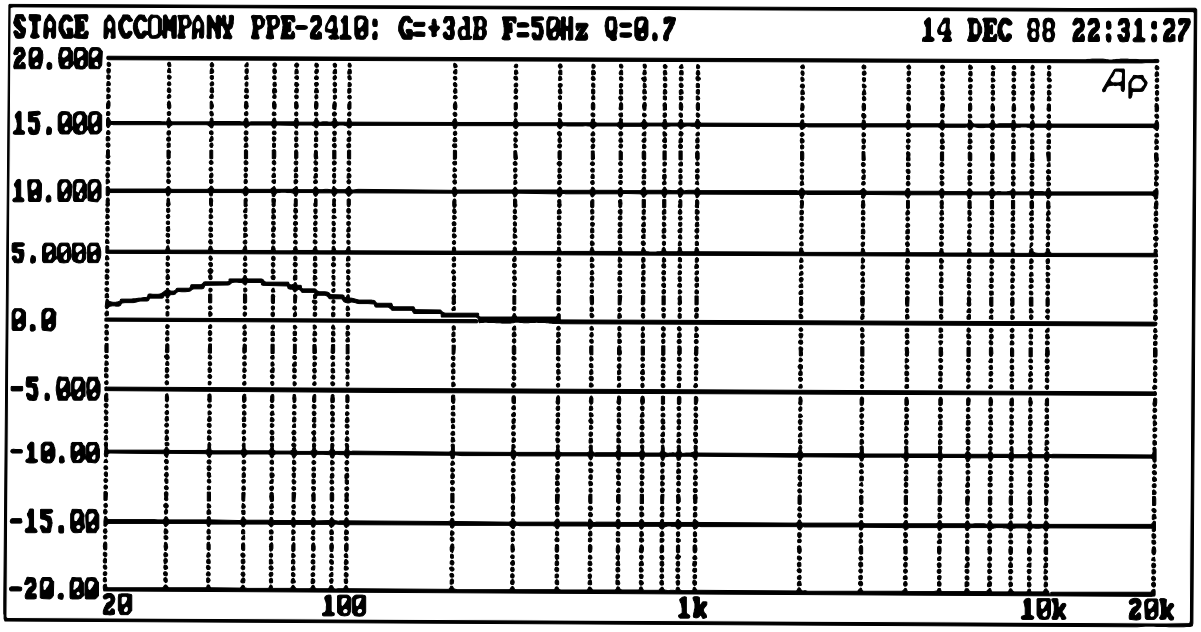


Figure 4-3 Frequency characteristics at +3 dB, 50 Hz and Q-factor = 0.7.

Chapter 9 contains a detailed explanation of the concepts "amplification/attenuation", "central frequency", "Q-factor" and "bandwidth".

4.2.2.1 Browsing Speed of Frequency Display

If you keep the <CENTER FREQUENCY> <UP> or <DOWN> keys depressed, the central frequency values change with a constant speed. You can choose one of eight different "browsing" speeds in the following manner:

First press the desired key on the numeric keypad (1 to 8) at the right of the PPE control panel. Number <1> selects a slow browsing speed, while number <8> selects a fast browsing speed. Subsequently, press the <FREQUENCY> <UP> or <DOWN> key. The new browsing speed is now set.

If you depress both the <FREQUENCY> <UP> and <DOWN> keys simultaneously, the slowest browsing speed will be selected.

4.2.2.2 Dual Function Amplification/Attenuation Keys

If you depress both the <BOOST/CUT> <UP> and <DOWN> keys simultaneously, the amplification/attenuation for the selected band will be set to 0 dB.

4.2.2.3 Dual Function Q-Factor Keys

If you depress both the <Q-FACTOR> <UP> and <DOWN> keys simultaneously, the Q-factor for the selected band will be set to 1.0

4.2.3 Band "Bypass" Function

Using the <BYPASS> keys, each frequency band can be individually switched out of the signal path.

If the "bypass" function is active, the related LED will be on. In this way, the influence of the equaliser settings per band can be simply compared with the original signal.

4.2.4 Band "Clip" Indication

If the signal level in an equaliser band exceeds a level of 20 dBm, the associated <CLIP> indicator lights up. "Clipping" is usually caused by an excessive amount of sound correction in a particular band. If this is the case, reduce the band amplification with the <BOOST/CUT> <DOWN> key or reduce the input signal level using the <INPUT LEVEL> <DOWN> key.

4.2.5 Equaliser "Reset" Function

The <EQ RESET> key allows you to reset the parameters of the equaliser section of the PPE back to their neutral values. All amplifications/attenuations will be set to 0 dB, all frequencies will be set to their minimum values (20 Hz, 60 Hz, 200 Hz and 600 Hz), and all Q-factors will be set to 1.0.

NOTE: The <EQ RESET> key must be held in for at least 1 second to effect resetting of the equaliser section. This delay prevents accidental resetting of the parameters.

4.3 Output Section

The output section of the PPE is illustrated in the following diagram.

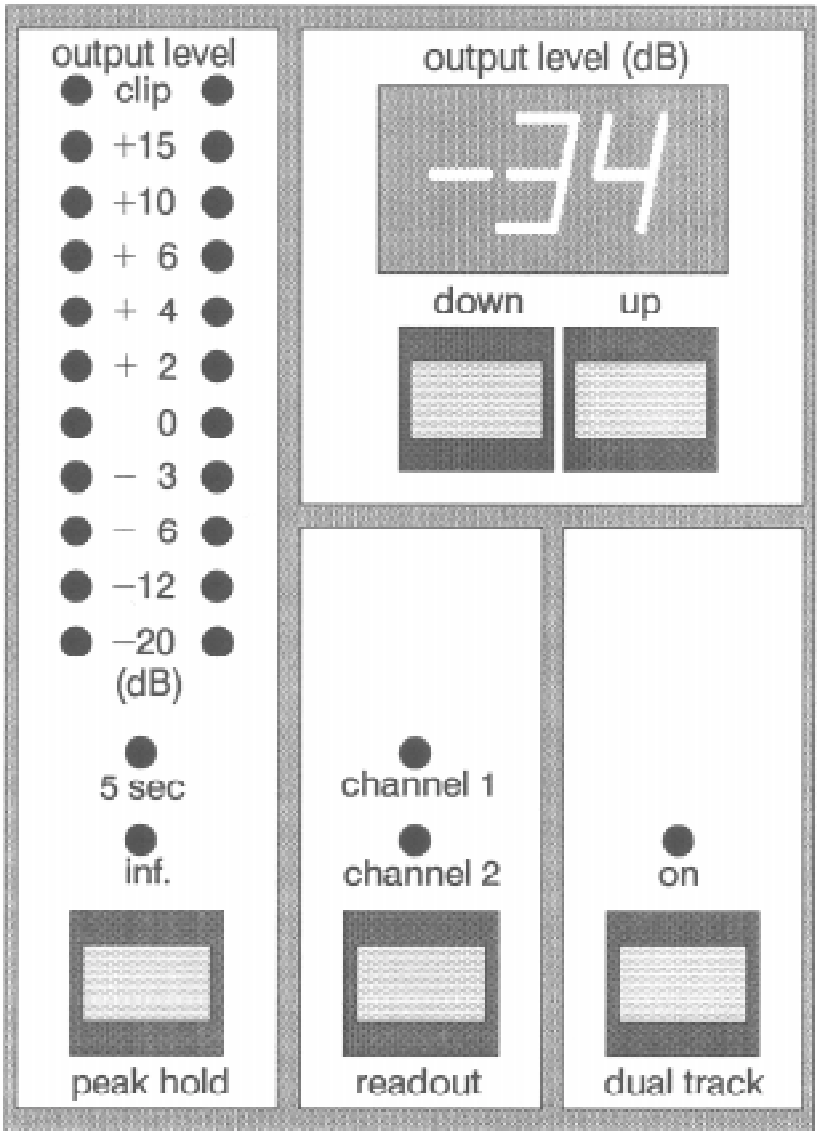


Figure 4-4 Output section of the PPE 2410.

The output section comprises four parts: the output level control, the "readout" key, the "dual track" key and the output level LED bars. The various parts of the output section are described in detail in the following sections.

4.3.1 Output Signal Level Control

The output level control functions similarly to the input level control. If you press both the <OUTPUT LEVEL> <UP> and <DOWN> keys simultaneously, the output level control will be directly set to OFF. No signal will then be allowed through. This facility can be used as an "emergency stop". The original level can be restored again by once more depressing both the <OUTPUT LEVEL> <UP> and <DOWN> keys simultaneously.

4.3.2 Output Signal "LED Bar" and "Peak Hold"

The <OUTPUT LEVEL> LED bar and associated <PEAK HOLD> key function in the same way as in the input section.

If the <CLIP> indicator of the output level led bar lights up, it means that too much signal from the equaliser section has been added to the original signal. To correct this it is usually sufficient to reduce the amplification of one or more bands using the <BOOST/CUT> <DOWN> key.

NOTE: It is possible that the output section may "clip" while the various bands do not "clip".

4.3.3 "Readout" Function

Using the <READOUT> key you can select which channel's settings will be shown in the displays. For each channel, the following settings will be displayed:

- Input level
- Extra input signal amplification
- Equaliser band settings
- Amplification/attenuation
- Central frequency
- Q-factor
- "Bypass" status
- Output level

4.3.4 "Dual Track" Function

The PPE has two independent channels, which can be programmed completely different. If the <DUAL TRACK> function is activated (red LED lights up), all changes to the settings of the PPE will be effected for both channel 1 and channel 2. Both channels can therefore be changed in one operation. This can be of importance for example when a PPE is used in a PA installation and you want the left-hand side of the PA installation to have the same equaliser settings as the right-hand side. Any differences in the settings of the channels will be maintained, however if one parameter in one channel reaches its maximum value, assuming there was a difference in the beginning, (for example outputlevel set to 0 and -10 dB, left and right respectively), then the oldest difference will not be maintained any more if you keep pushing up the outputlevel

If you subsequently want different settings for the two channels, first switch the <DUAL TRACK> function off and then select channel 1 or 2 using the <READOUT> switch. Any changes now made will be effective only for the selected channel. The settings of the other channel remain unchanged until one of the parameters reaches its maximum value.

4.4 Memory Section

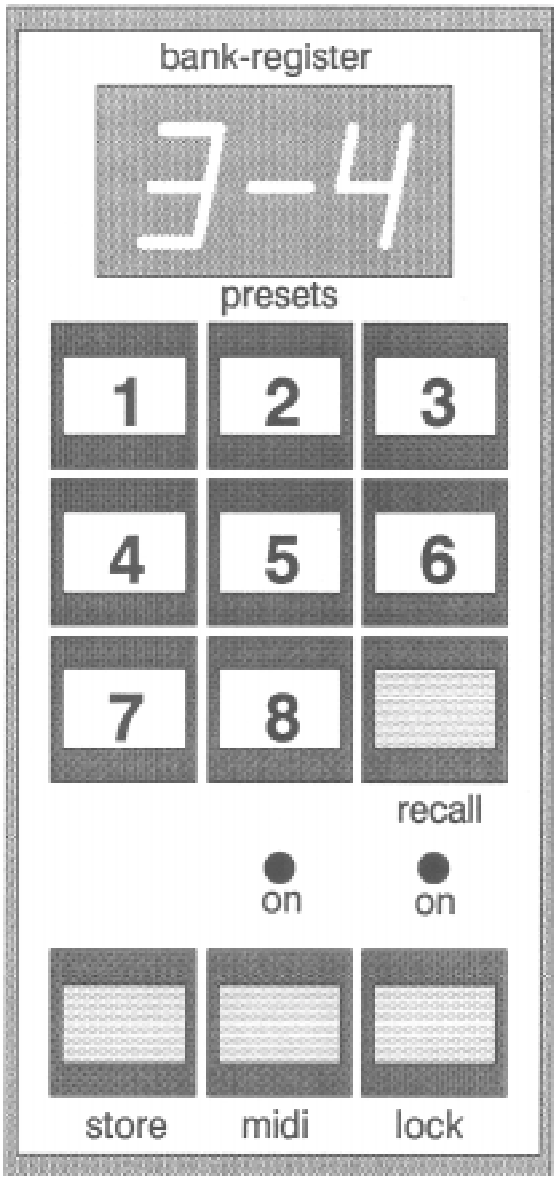


Figure 4-5 Memory section of the PPE 2410.

The memory section of the PPE is illustrated in the above diagram.
The memory section comprises three parts: the 64 presets, the <MIDI> function and the <LOCK> function. The various parts of the memory section are described in detail in the following sections.

4.4.1 Presets

All settings of the PPE will be retained if it is switched off and then on again. Furthermore, a combination of the settings, with the exception of the <PEAK HOLD>, <BAND SELECT>, <READOUT>, <MIDI> and <LOCK> functions, can be stored in a memory location or preset. To allow you to store a range of equaliser settings, the PPE 2410 has 64 memory locations, formed from 8 banks, each of which is subdivided into 8 registers. The following table illustrates the structure of the preset memory:

presets	bank1	bank2	bank3	bank4	bank5	bank6	bank7	bank8
register1	1-1	2-1	3-1	4-1	5-1	6-1	7-1	8-1
register2	1-2	2-2	3-2	4-2	5-2	6-2	7-2	8-2
register3	1-3	2-3	3-3	4-3	5-3	6-3	7-3	8-3
register4	1-4	2-4	3-4	4-4	5-4	6-4	7-4	8-4
register5	1-5	2-5	3-5	4-5	5-5	6-5	7-5	8-5
register6	1-6	2-6	3-6	4-6	5-6	6-6	7-6	8-6
register7	1-7	2-7	3-7	4-7	5-7	6-7	7-7	8-7
register8	1-8	2-8	3-8	4-8	5-8	6-8	7-8	8-8

Table 4-1 Structure of the preset memory.

The following diagram is a schematic representation of the internal structure of the PPE that will clarify the manner of working with presets.

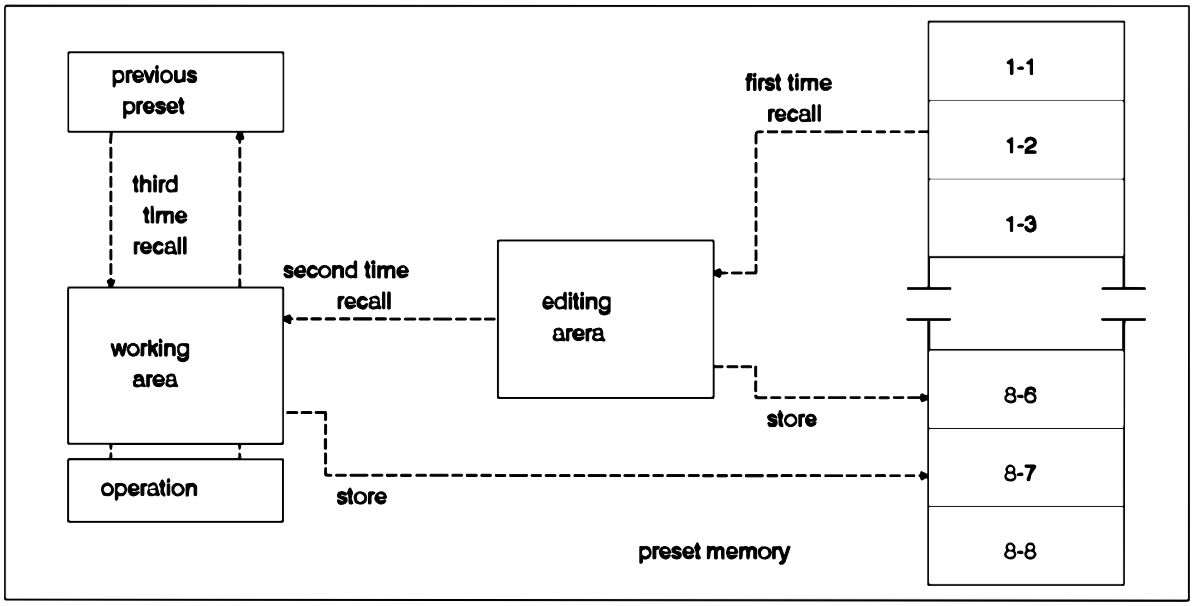


Figure 4-6 Internal structure of the PPE 2410.

The working area contains the equaliser settings that are currently audible and visible in the displays. These settings can be changed using the control facilities.

If a preset is called from the preset memory, there is a chance that the settings of the preset differ too much from the settings in the working area. In this case, the output level can change from OFF to 0 dB for example, which could lead to overload of the system.

To prevent this sort of unwanted surprise, the PPE is provided with a so-called editing area. If a preset is called using the <RECALL> key, the preset's settings are first copied to the editing area. In this area, the settings are only visible in the displays. They are not yet audible. You can now examine the settings before deciding whether to copy them to the working area, where they will become audible.

The following preset capabilities will be successively described:

- Selecting and programming presets
- Examining, editing and copying presets
- Activating, comparing and reactivating presets

4.4.1.1 Selection and Programming of Presets

To select and program presets, proceed as follows. After adjusting the equaliser as desired, select a preset by pushing a bank number, for example <1>. The display will show the following:

bank-register: | _ 1 |

Then select the register number, for example <2>. The display will then show:

bank-register: | 1 _ 2 |

If you make a mistake when selecting a number, simply continue pushing the bank and register numbers until the desired memory location is shown in the display.
Then press the <STORE> key until the display shows:

bank-register: | – – – |

The three dashes show that the equaliser settings have been stored in preset 1_2. In this way, up to 64 presets can be made by changing the settings in the working area and then storing them.

4.4.1.2 Examination, Editing and Copying of Presets

To examine a specific preset, proceed as follows. Select the desired preset by first pushing the bank number, for example <2>. The display will show:

bank-register: | _ 2 |

Then select the register number, for example <3>. The display will now show:

bank-register: | 2 _ 3 |

Subsequently press the <RECALL> key once. On doing this the dash between the bank and register number will switch to the upper position. The display will show:

bank-register: | 2 ¯ 3 |

The settings of preset 2-3 have now been copied to the editing area. You can repeat the examination procedure by selecting another bank and register number and subsequently pressing the <RECALL> key.

As long as the dash between the bank and register number is in the upper position, the settings can be changed without audible effect. The dash will flash on and off to indicate that changes have been made. The settings in the editing area are no longer identical to those of the preset. If you want to store these new settings in the same preset, simply press <STORE> until the display shows three dashes:

bank-register: | – – – |

If you want to save the settings in another preset, you must first select the desired preset and save the settings as described in 4.4.1.1. In this way, you can copy presets without any audible effect. To do this, first select the preset that you want to copy and press <RECALL>. Then choose a second preset, which is the destination that the first preset will be copied to. Press <STORE> until the three dashes appear. The preset has now been copied into the second memory location.

4.4.1.3 Activating and Comparing Presets

To activate a preset, proceed as follows. Select the desired preset by first pressing the bank number, for example <3>. The display will show:

bank-register: | _3 |

Then press the register number, for example <4>. The display will now show:

bank-register: | 3_4 |

Subsequently press the <RECALL> key. The display will show:

bank-register: | 3¯4 |

The settings of preset 3-4 are activated by pressing <RECALL> once more. On doing this, the dash will move from the upper position to the middle position. The display will show:

bank-register: 3 – 4

The settings that were previously visible in the displays will now become audible. If you want to activate the preset without first examining the settings, you can simply press <RECALL> twice after selecting the desired preset. The settings of the selected preset will then become directly activated and therefore directly audible.

You can compare the settings of two presets audibly in the following way. Activate one of the two presets as described. This preset will now be audible. Now activate the second preset. This preset will now become the audible one. If you now press <RECALL> again, the PPE will reactivate the first preset. The two presets can now be audibly compared by pressing the <RECALL> key successively. Every time <RECALL> is pressed, the PPE will alternate between the two presets. This is represented schematically in diagram 4.6.

After a preset has been activated (made audible), you can change the settings in the working area. If the settings in the working area are no longer identical with the settings of the preset, the PPE will indicate this by means of a flashing dash in the middle position between the bank and register number. If you wish to revert to the settings of the preset after changing the settings in the working area, simply press <RECALL> once, upon which the original preset will be reactivated. The dash between the bank and register number will no longer flash, indicating that the settings of the working area are identical to those of the preset.

NOTE: To prevent switching "clicks" when activating presets, the PPE changes smoothly from the old settings to the new settings. There is no abrupt jump from the old settings to the new settings. If the settings of the working area differ significantly from the settings of the preset, the display will react to a <RECALL> with a slight delay. Audibly, however, the change takes place directly.

4.4.2 The "Lock" Key

The "lock" function can be divided into three parts:

- Locking operation
- Unlocking operation
- Programming the locking code

4.4.2.1 Locking Operation

To prevent unwanted changes to the settings, the operation of the PPE can be locked. Display of the various settings is, however, still possible. The <PEAK HOLD>, <BAND SELECT> and <READOUT> keys still remain operative. The extra input signal amplification can also be viewed. To lock operation, press the <LOCK> key. The red LED above the <LOCK> key will light up to indicate that operation has been locked.

4.4.2.2 Unlocking Operation

To unlock the operation, press the <LOCK> key until the <BANK REGISTER> shows:

bank-register: _ _ _

The three dashes flash to indicate that the locking code should now be entered. When you lock the PPE for the first time, the default locking code is 1. So, enter the number 1 from the numeric keypad. The display will show:

bank-register: 1

Now press the <LOCK> key. The red LED will go out to indicate that operation is no longer locked. If the wrong locking code is entered, operation remains locked and the dashes reappear. You can now attempt to enter the correct code again.

4.4.2.3 Programming the Locking Code

Press the <STORE> key and keep it depressed. Then press the <LOCK> key.
The display will now show:

bank-register: | _ _ _ |

The three dashes flash to indicate that a new locking code can be entered. You can now press <RECALL> to display the current locking code. If you do not want to change the current code, you can leave this function by pressing either the <STORE> key or <LOCK> key. If, however, you do want to change the locking code, you can now enter the new code. If for example you want a locking code of 123, enter these figures and the display will show:

bank-register: | 1 2 3 |

Now press either the <STORE> or <LOCK> key to store the new locking code.

4.4.3 The MIDI Key

With the <MIDI> key, the MIDI function of the PPE can be switched on or off. The LED will light up when the MIDI is switched on.

5 The MIDI Interface

The MIDI interface has three facilities:

- MIDI Program Number
- MIDI Channel Number (1 - 16)
- MIDI Omni on/off.

5.1 MIDI Program Number

Through MIDI, the PPE can transmit and receive so-called program numbers (program change messages). Using an external controller (keyboard, sequencer, etc.), any preset can be recalled at will. For this purpose, each of the 64 presets of the PPE can be coupled to any of the MIDI program numbers of the MIDI controller. The coupling between MIDI program numbers and the presets is set using the <KEYPAD FUNCTION 1> (paragraph 6.1).

Now, whenever a PPE preset is recalled using the <RECALL> key, the equaliser will transmit the corresponding MIDI program number through MIDI, providing the MIDI function is activated. This facility enables synchronization to other equipment by activating PPE presets.

To enable the recall of presets by an external controller, the MIDI function must be activated. In addition, the PPE MIDI channel number must correspond with the incoming channel number.

5.2 MIDI Channel Number (1 - 16)

MIDI information can be sent over 16 channels, numbered 1 - 16. In this way, it is possible to connect 16 pieces of equipment using the same cable. Each piece of equipment is set to a unique channel number so that it receives only the information destined for it. The MIDI channel number is set using the <KEYPAD FUNCTION 2> (paragraph 6.2).

5.3 MIDI Omni on/off

Apart from receiving information from one particular channel, it is possible to receive the information from all channels, irrespective of the programmed channel number. For this purpose, the PPE has a MIDI "omni" facility. If the MIDI omni facility is off, only the information for the programmed channel will be received. If, on the other hand, the MIDI omni facility is on, the information from all channels will be received. The MIDI omni function can be switched on and off using <KEYPAD FUNCTION 3> (paragraph 6.3).

6 "Keypad" Functions

In addition to the usual equaliser functions, the PPE has eight so-called "keypad" functions. These functions are activated by pressing the relevant numeric key of the keypad (1 - 8) for 1 second. To leave a particular function, just press the <STORE> or <RECALL> key. If you press the <STORE> key for 1 second, any changes you have made will be stored. If you press the <RECALL> key, the changes will not be stored.

The keypad functions can be summarized as follows:

1 - MIDI program number - preset table editing
2 - MIDI channel number setting
3 - MIDI omni mode setting
4 - MIDI parameters reset
5 - "Preset only mode" setting
6 - Leveller adjustment
7 - Reset all presets
8 - Display of software version number and ID-code.

The eight keypad functions are described in the following Sections.

6.1 Changing the MIDI Program Number Preset Table

MIDI recognizes 128 program numbers (0 - 127). In the factory, program number 0 is coupled to preset 1-1, program number 1 to preset 1-2, program number 2 to preset 1-3, etc. Program number 63 is coupled to preset 8-8 and program number 64 is coupled to preset 1-1 again. The highest program number, 127, is coupled to preset 8-8.

NOTE: From software version 1.2 and up, the program numbers range from 0 - 127. If the software version of your PPE is 1.1 (see paragraph 6.8), the MIDI program numbers range from 1 - 128 and NOT 0 - 127. In this case, if you want to select for example MIDI program number 45, you should add a "1" and thus select program number 46.

However, you can couple the MIDI program numbers to the presets in any order you desire. Program numbers can be coupled to presets in the following manner:

Example

Assume you want to couple program number 5 to preset 3-8 and program number 31 to preset 7-2. First press numeric key "1" of the keypad for one second until the display shows:

		PrOG.	0	to	1 – 1

Press the <Q-FACTOR> <UP> key until the display shows:

		PrOG.	5	to	1 – 6

Now press the numeric keys "3" and "8" on the keypad. The display will then show:

		PrOG.	5	to	3 – 8

Then press the <Q-FACTOR> <UP> key until the display shows:

		PrOG.	31	to	4 – 8

Now press the numeric keys "7" then "2". The display will show:

		PrOG.	31	to	7 – 2

Leave the MIDI program change function be pressing <STORE> for one second. The changes just made will now be stored. The changes will be discarded if you leave the function by pressing <RECALL>.

In this way you can couple the 64 presets of the PPE to the 128 MIDI program numbers in any way desired. Because the MIDI numbering (0 - 127) is different from the PPE preset numbering (1-1 to 8-8), a table illustrating the default MIDI program number - PPE preset coupling is included on the following page.

Keypad

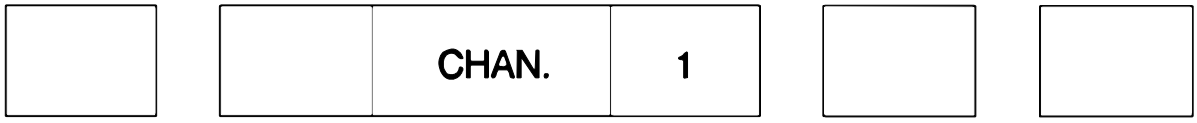
MIDI = PPE	MIDI = PPE	MIDI = PPE	MIDI = PPE	MIDI = PPE
0 = 1-1	13 = 2-6	26 = 4-3	39 = 5-8	52 = 7-5
1 = 1-2	14 = 2-7	27 = 4-4	40 = 6-1	53 = 7-6
2 = 1-3	15 = 2-8	28 = 4-5	41 = 6-2	54 = 7-7
3 = 1-4	16 = 3-1	29 = 4-6	42 = 6-3	55 = 7-8
4 = 1-5	17 = 3-2	30 = 4-7	43 = 6-4	56 = 8-1
5 = 1-6	18 = 3-3	31 = 4-8	44 = 6-5	57 = 8-2
6 = 1-7	19 = 3-4	32 = 5-1	45 = 6-6	58 = 8-3
7 = 1-8	20 = 3-5	33 = 5-2	46 = 6-7	59 = 8-4
8 = 2-1	21 = 3-6	34 = 5-3	47 = 6-8	60 = 8-5
9 = 2-2	22 = 3-7	35 = 5-4	48 = 7-1	61 = 8-6
10 = 2-3	23 = 3-8	36 = 5-5	49 = 7-2	62 = 8-7
11 = 2-4	24 = 4-1	37 = 5-6	50 = 7-3	63 = 8-8
12 = 2-5	25 = 4-2	38 = 5-7	51 = 7-4	

MIDI = PPE	MIDI = PPE	MIDI = PPE	MIDI = PPE	MIDI = PPE
64 = 1-1	77 = 2-6	90 = 4-3	103 = 5-8	116 = 7-5
65 = 1-2	78 = 2-7	91 = 4-4	104 = 6-1	117 = 7-6
66 = 1-3	79 = 2-8	92 = 4-5	105 = 6-2	118 = 7-7
67 = 1-4	80 = 3-1	93 = 4-6	106 = 6-3	119 = 7-8
68 = 1-5	81 = 3-2	94 = 4-7	107 = 6-4	120 = 8-1
69 = 1-6	82 = 3-3	95 = 4-8	108 = 6-5	121 = 8-2
70 = 1-7	83 = 3-4	96 = 5-1	109 = 6-6	122 = 8-3
71 = 1-8	84 = 3-5	97 = 5-2	110 = 6-7	123 = 8-4
72 = 2-1	85 = 3-6	98 = 5-3	111 = 6-8	124 = 8-5
73 = 2-2	86 = 3-7	99 = 5-4	112 = 7-1	125 = 8-6
74 = 2-3	87 = 3-8	100 = 5-5	113 = 7-2	126 = 8-7
75 = 2-4	88 = 4-1	101 = 5-6	114 = 7-3	127 = 8-8
76 = 2-5	89 = 4-2	102 = 5-7	115 = 7-4	

Table 6-1 MIDI program number - preset couplings.

6.2 Changing the MIDI Channel Number

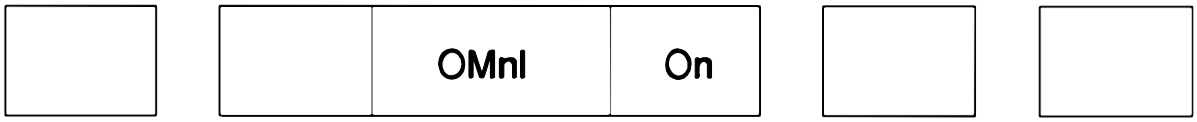
Press numeric key "2" of the keypad for one second until the display shows:



Use the <Q-FACTOR> <UP> and <DOWN> keys to change the channel number as desired. Press <STORE> to preserve any alternation or press <RECALL> to quit.

6.3 Setting the Omni Mode

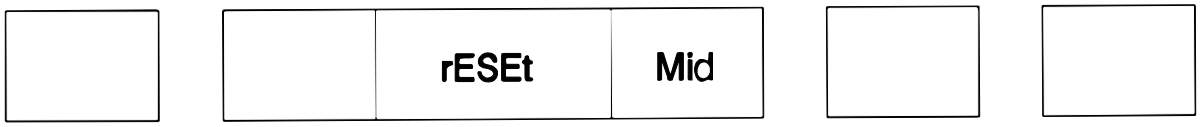
Press numeric key "3" of the keypad for one second until the display shows:



Use the <Q-FACTOR> <UP> and <DOWN> keys to turn the omni mode on or off as desired. Press <STORE> to preserve any alternation or press <RECALL> to quit.

6.4 Resetting MIDI Parameters

Press numeric key "4" of the keypad for one second until the display shows:



The "reset MIDI" function restores the program number - preset table to the system described in Section 6.1 (linear programming). The channel number is set to 1, while the omni mode is switched on.

This function (reset MIDI) is only executed if you leave this function by pressing the <STORE> key for one second. If you leave the function by pressing the <RECALL> key for one second, the MIDI parameters are not reset.

6.5 "Presets Only Mode" Adjustment

This confidential information is printed in chapter 13.1. Chapter 13 may be omitted in this manual for safety reasons.

6.6 Leveller Adjustment

This confidential information is printed in chapter 13.2. Chapter 13 may be omitted in this manual for safety reasons.

6.7 Resetting All Presets

Press numeric key "7" of the keypad for one second until the display shows:

	Pr.	rESEt			

This function resets all presets. This means that both the <INPUT LEVEL> and <OUTPUT LEVEL> controls will be set to OFF. The extra gain will be set to 0 dB. All <BOOST/CUT> parameters will be set to 0 dB. All <FREQUENCIES> will be set to the start value of the particular band (20 Hz, 60 Hz, 200 Hz and 600 Hz). All <Q-FACTORS> will be set to 1.0. The <EQ IN/OUT> functions will be switched IN and no bands will be <BYPASSED>. Furthermore, <DUAL TRACK> will be switched ON. The equaliser itself can be reset by activating a preset (for example 1-1) after executing this function.

This function (reset presets) is only executed if you leave this function by pressing the <STORE> key for one second. If you leave the function by pressing the <RECALL> key for one second, the presets are not reset.

6.8 Software Version Number, ID Code, and Filter Configuration

Press numeric key "8" of the keypad for one second until the display shows:

1.2	Id.	123			

This function displays the software version number in the left display. In addition, the ID code is displayed in the central display and the filter configuration is displayed in the right-hand display. The software version number shown here (1.2) is only an example: your software version number may be different. The ID code shown here (123) is also only an example. The ID code of your PPE can be found in the serial number on the rear of the equaliser. The last four numbers of the serial number form the ID code. The filter configuration shown here (parallel) is also an example: your filter configuration may be serial (SEr). For more information about the filter configuration, see chapter 11.

7 Special Functions

In addition to the keypad functions, the PPE has a number of special functions. These functions are described in this Chapter and comprise:

- Copying the Channel Settings
- "Presets Only Mode"
- "Leveller" Function

7.1 Copying the Channel Settings

The settings of the two channels can vary if the <DUAL TRACK> is inactive. In this case, the PPE has a function to copy the settings of channel 1 to channel 2 or vice versa. Select the number of the channel whose settings you want to copy using the <READOUT> key. Then press the <DUAL TRACK> key until both <READOUT> LEDs and the <DUAL TRACK> LED light up. Now release the <DUAL TRACK> key. The settings of one channel have now been copied to the other.

7.2 "Presets Only Mode"

In the "presets only mode" only presets can be activated. The rest of the operating functions are locked, with the exception of the readout functions. The presets only mode may be useful in situations where unauthorised alteration of preset settings is not desirable for any reason.

When the presets only mode is activated, the decimal point of the <BANK REGISTER> display travels from left to right. The display can then appear as follows:

bank-register: 1 – 3.

The presets only mode is activated using <KEYPAD FUNCTION 5>

7.3 "Leveller" Function

To help clarify the working of the PPE "leveller", the internal configuration is illustrated in the following diagram.

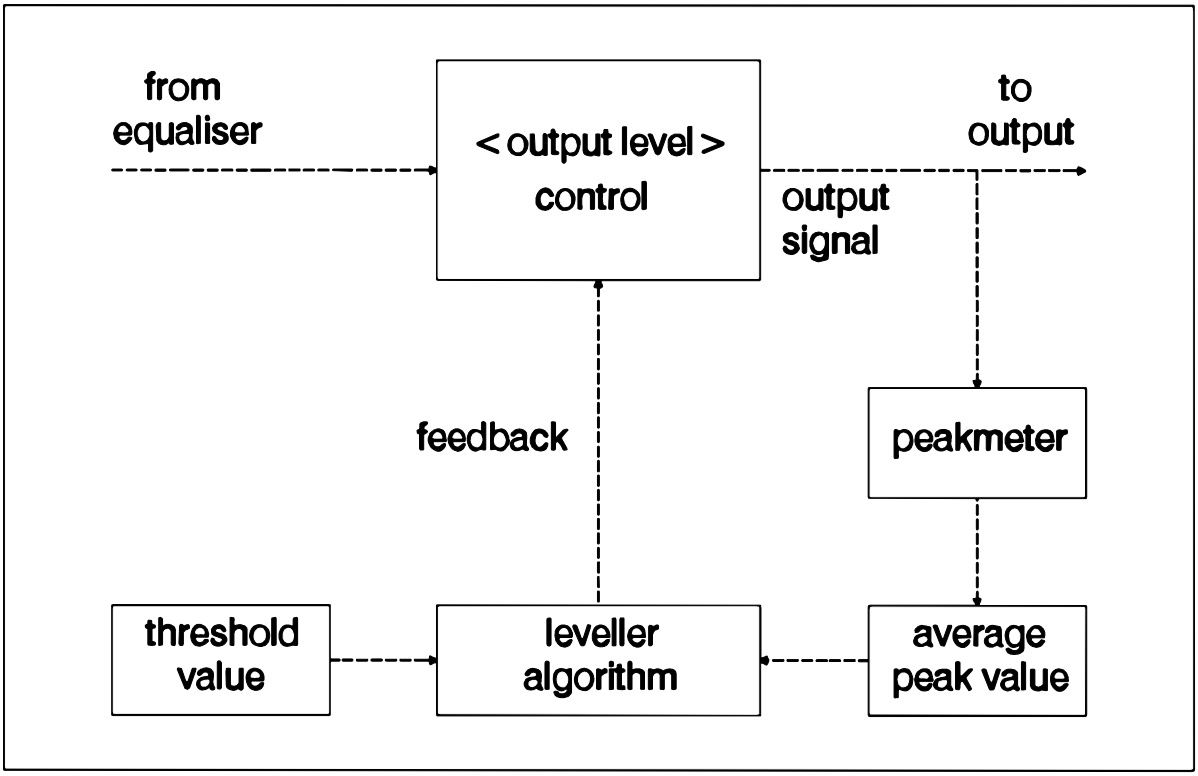


figure 7-1 Block diagram of the PPE 2410 leveller.

The peakmeter fixes the peaks of the output signal. Subsequently, the average value of these peaks is determined. This average peak value is passed to the leveller control algorithm in the microcomputer. The leveller algorithm compares the average peak value with the programmed threshold value.

The output signal is reduced via the <OUTPUT LEVEL> control if the threshold value is exceeded. When the output signal is again sufficiently below the threshold value, the signal is again amplified. The threshold value can be adjusted between 0 dBm and +15 dBm in steps of 1 dB (see paragraph 6.6). A flashing <OUTPUT LEVEL> display indicates that the leveller is active.

The speed of the output signal reduction is program dependent. This means that the attack is determined by the extent to which the threshold value is exceeded. The greater the excess, the faster the leveller reduction. This is also true for the speed with which the signal is again amplified (= release). If the output signal is small compared to the threshold value, the signal will be quickly amplified after levelling. The ratio between attack and release is 12.

The leveller can be activated using <KEYPAD FUNCTION 6> (see paragraph 6.6). The threshold value can also be set.

NOTE: Because most power amplifiers are fed with an input signal of 0 dBm to +6 dBm, it is possible that the threshold signal range of 0 dBm to +15 dBm is too high. To solve this problem, the output signal of the PPE can be reduced by 10 dB for example in the next piece of equipment. The threshold signal range is reduced to -10 dBm to +5 dBm using this method. If the PPE is used in combination with a Blue Box or PPA 1200, the reduction can take place in the input stage of the Blue Box or PPA 1200. To accomplish this, the <LEVEL> control in the Blue Box or PPA 1200 should be set to -10 dB.

8 "Power on/off" Functions

The following special functions can be activated by pressing one or more special keys while the PPE is being switched on.

- "Signal Present" Time Display
- Resetting the <LOCK> and <LOCK CODE>
- Activating the <BOOT> Mode

To deactivate these functions, switch off the PPE and then switch it on again in the normal way.

8.1 "Signal Present" Time Display

The "signal present" time of the equaliser is defined as the time during which the input signal level has been greater than -20 dB. This signal present time (in hours) can be displayed by pressing the EQ IN/OUT key of channel 1 while turning on the PPE. The signal present time can only be reset by a Stage Accompany dealer via SAnet using an IBM (compatible) PC.

8.2 Resetting the <LOCK> and <LOCK CODE>

This confidential information is printed in chapter 13.3. Chapter 13 may be omitted in this manual for safety reasons.

8.3 Activating the <BOOT> Mode

The PPE 2410 is provided with an electrically reprogrammable software memory. As a result, it is possible to update the software via SAnet, without having to open the casing.

To provide the PPE with new software, the so-called <BOOT> mode has to be activated. An IBM (compatible) PC can then be used to update the software via SAnet.

On/Off Functions

To activate the <BOOT> mode, press <BAND SELECT> keys 1 and 4 while switching on the PPE until the display shows:

. . .		boot	P	

The three dots in the left-hand display flash to indicate that the <BOOT> mode is active. The "P" in the right-hand display shows that the PPE already has software installed ("P" from programmed). If the software memory is empty or defective, the display will show "E" ("E" from empty). Contact your dealer for more information about updating the PPE via SAnet using an IBM (compatible) PC.

9 Parametric Equaliser, Bandwidth and Q-Factor

A parametric equaliser makes it possible to adjust three essential parameters of an equaliser completely independently from each other. These three parameters are:

- The amount of amplification or attenuation
- The frequency whereby the amplification or attenuation is a maximum
- The frequency region influenced by the equalisation.

The frequency region influenced by the equalisation is also called the bandwidth. The bandwidth is defined as the distance between the -3 dB frequencies of a band filter. This is illustrated in the following figure.

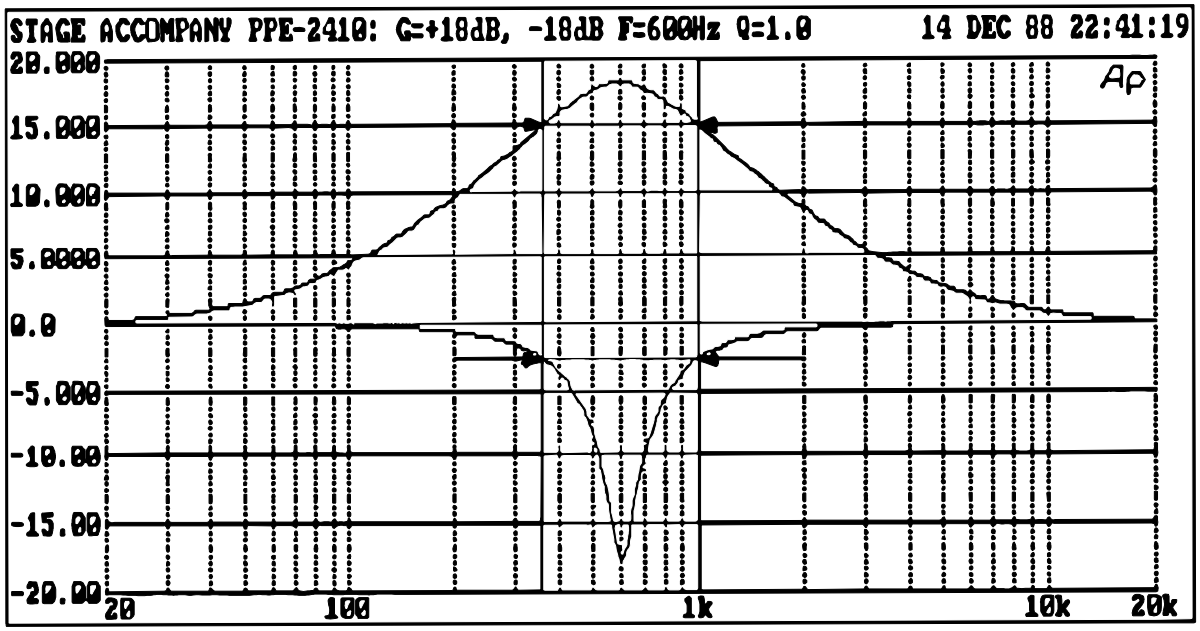


Figure 9-1 Characteristics at +/- 18 dB, 600 Hz, Q-factor = 1.0.

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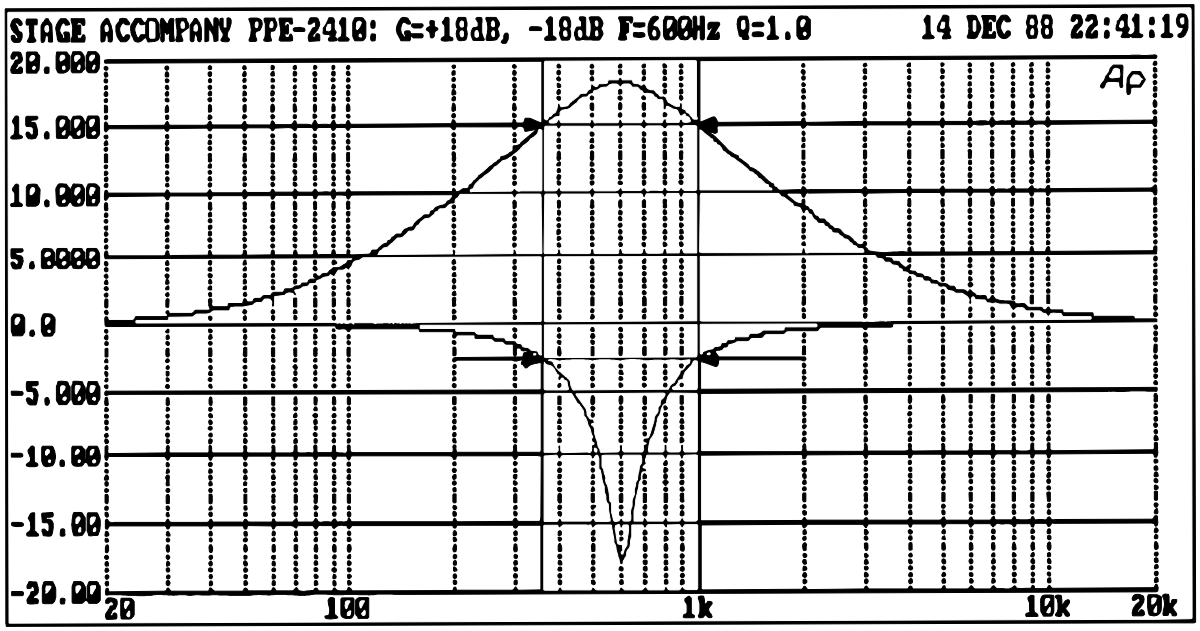

Figure 9-1 Characteristics at +/- 18 dB, 600 Hz, Q-factor = 1.0.

The bandwidth is an unfortunate choice of parameter. Because the human ear has a logarithmic frequency sensitivity, the bandwidth at higher frequencies would have to become increasingly larger (assuming the audible effect remains constant). The following example will clarify this.

Assume you want to amplify the frequency range around 100 Hz by +10 dB and with a bandwidth of 20 Hz (from 90 Hz to 110 Hz). This will have a certain audible effect. Assume you now want to amplify the frequency range around 1000 Hz by +10 dB and with the same effect obtained at 100 Hz. A bandwidth of 20 Hz with a central frequency of 1000 Hz has a smaller audible effect than with a central frequency of 100 Hz. To achieve the same effect at 1000 Hz, the bandwidth must be increased to 200 Hz. It must be increased by a factor 10, the same relationship as 100 Hz to 1000 Hz. It is apparent that the bandwidth must be increased by the same factor "X" by which the central frequency is increased. This applies in the opposite sense of course if the central frequency is reduced.

It is interesting to define a parameter that gives the relationship between the bandwidth and central frequency, since this would eliminate the factor "X". This parameter is called the Q-factor and is defined as follows:

$$\text{Q-factor} = \frac{\text{central frequency}}{\text{bandwidth}}$$

From the 100 Hz example above, the Q-factor can be calculated as:

$$\text{Q-factor} = \frac{\text{central frequency}}{\text{bandwidth}} = \frac{100}{20} = 5$$

In the 1000 Hz example, the Q-factor is:

$$\text{Q-factor} = \frac{\text{central frequency}}{\text{bandwidth}} = \frac{1000}{200} = 5$$

Both Q-factors are identical. The Q-factor is thus a parameter that indicates what the effect of a specific equalization will be, independent of the central frequency. If you examine the Q-factor formula, you see that a large bandwidth will result in a small Q-factor. Conversely, a small bandwidth will result in a large Q-factor.

The formula can also be used to determine the bandwidth at a specified central frequency and Q-factor. The formula is then rearranged as follows:

$$\text{bandwidth} = \frac{\text{central frequentie}}{\text{Q-factor}}$$

Example: Assume you want to adjust the equaliser to a central frequency of 1000 Hz, with a Q-factor of 2. Which are the -3 dB frequencies and what is the bandwidth? Substituting the various values into the formula gives:

$$\text{bandwidth} = \frac{\text{central frequentie}}{\text{Q-factor}} = \frac{1000}{2} = 500$$

The bandwidth is therefore 500 Hz. In practice, we can easily determine the -3 dB frequencies by reducing the central frequency by one half the bandwidth ("low" -3 dB frequency: 500 - 250 = 250 Hz) and increasing it by one half the bandwidth ("high" -3 dB frequency: 500 + 250 = 750 Hz). These frequencies are, however, only approximations. The exact -3 dB frequencies are determined by dividing and multiplying the central frequency by a factor "K". This factor is found from the following formula (where * means multiply):

$$K = \frac{\sqrt{1+4*Q*Q} + 1}{2 * Q}$$

If we substitute the Q value of the last example:

$$K = \frac{\sqrt{17} + 1}{4} = \frac{5{,}12}{4} = 1{,}28$$

The low -3dB frequency can now be calculated by dividing the central frequency by K: 1000/1.28 = 780 Hz. The high -3 dB frequency can be found by multiplying the central frequency by K: 1000 * 1.28 = 1280 Hz. The bandwidth is thus 1280 - 780 = 500 Hz.

It is apparent that the calculated values of the -3 dB frequencies deviate from the first determined values (shifted by 30 Hz). The deviation becomes larger as the Q-factor becomes smaller. The -3 dB frequencies at a central frequency of 1000 Hz and Q-factor of 0.5 for example are 414 Hz and 2414 Hz, and not 0 Hz and 2000 Hz. To simplify the calculation of the -3 dB frequencies, the following table gives the corresponding K value for a range of Q-factors.

Q - K	Q - K	Q - K	Q - K	Q - K
0.3 - 3.61	1.3 - 1.46	2.3 - 1.24	3.4 - 1.16	5.9 - 1.09
0.4 - 2.85	1.4 - 1.42	2.4 - 1.23	3.5 - 1.15	6.4 - 1.08
0.5 - 2.41	1.5 - 1.39	2.5 - 1.22	3.7 - 1.14	7.0 - 1.07
0.6 - 2.14	1.6 - 1.36	2.6 - 1.21	3.8 - 1.14	7.6 - 1.07
0.7 - 1.94	1.7 - 1.34	2.7 - 1.20	4.0 - 1.13	8.5 - 1.06
0.8 - 1.80	1.8 - 1.32	2.8 - 1.19	4.3 - 1.12	9.5 - 1.05
0.9 - 1.70	1.9 - 1.30	2.9 - 1.19	4.5 - 1.12	10.8 - 1.05
1.0 - 1.62	2.0 - 1.28	3.0 - 1.18	4.8 - 1.11	12.6 - 1.04
1.1 - 1.55	2.1 - 1.27	3.1 - 1.17	5.1 - 1.10	15.0 - 1.03
1.2 - 1.50	2.2 - 1.25	3.2 - 1.17	5.5 - 1.10	

Table 9-1 Bandwidth factors for various Q-factors.

10 Various Settings and Related Graphs

This Chapter contains a number of frequency graphs to give you an impression of the curves that correspond with various settings.

The curves in figure 10-1 were made at a constant central frequency of 600 Hz and a constant Q-factor of 1.0. The amplification varied from 0 dB to +18 dB in steps of 2 dB.

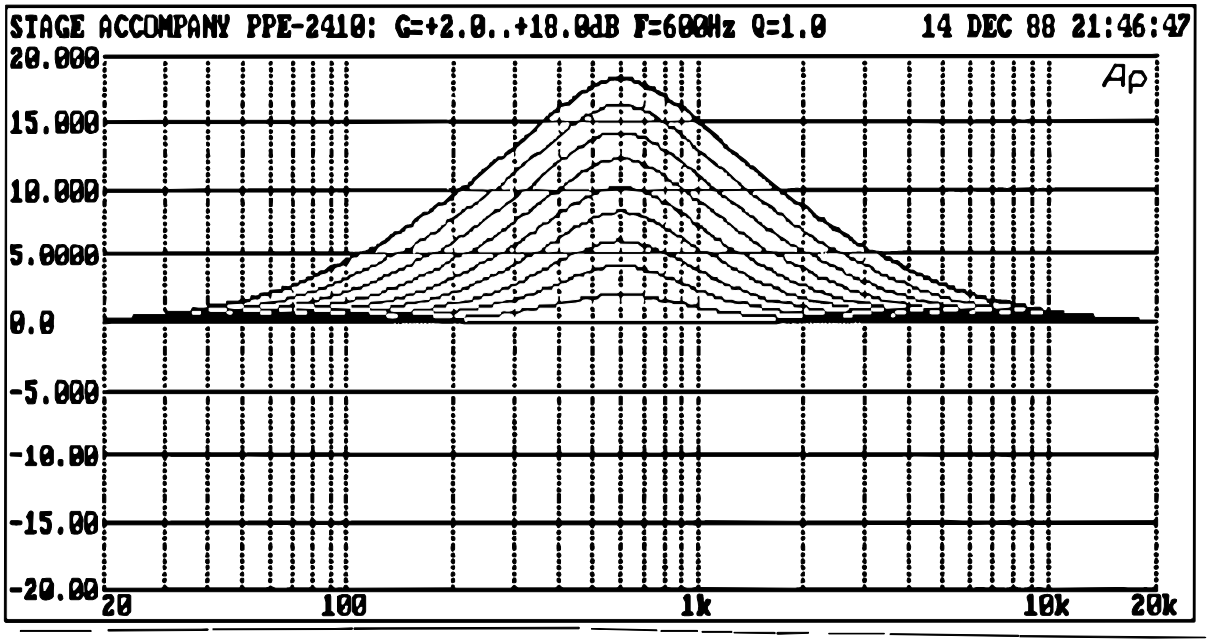

Figure 10-1 Variable amplification, F = 600 Hz, Q = 1.0.

The curves in figure 10-2 were made at a constant central frequency of 600 Hz and a constant Q-factor of 1.0. The amplification varied from 0 dB to -18 dB in steps of 2 dB.

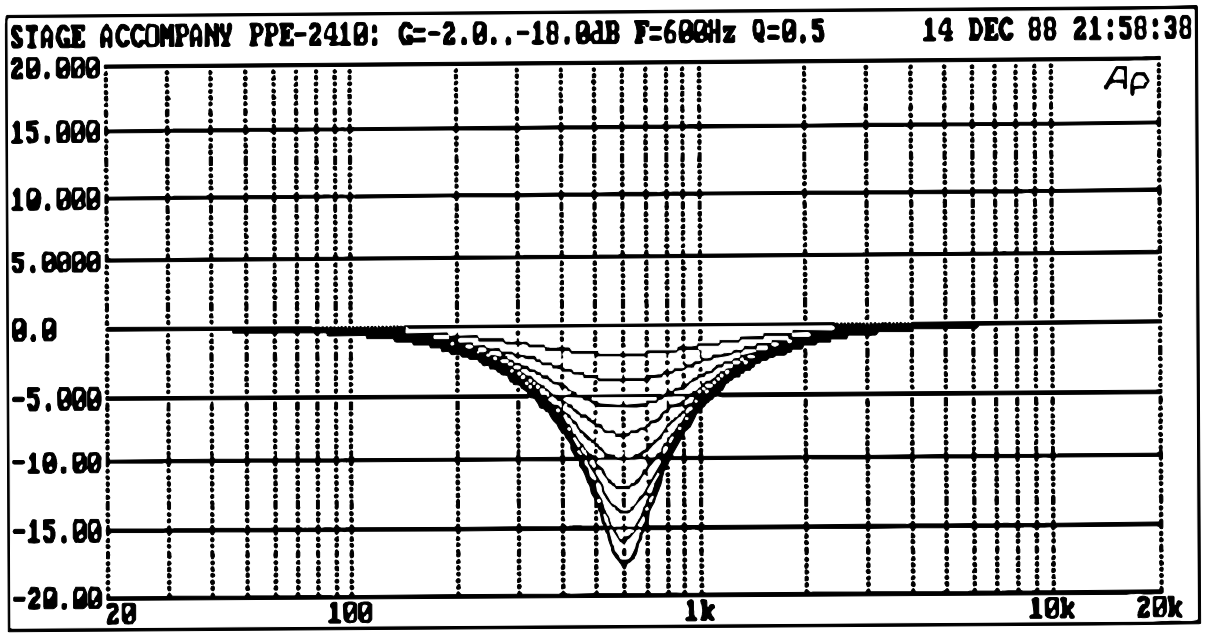

Figure 10-2 Variable amplification, F = 600 Hz, Q = 1.0.

The curves in figure 10-3 were made at a constant amplification of +15 dB and a constant Q-factor of 1.0. The central frequency varied from 100 Hz to 4 kHz in 11 logarithmic steps.

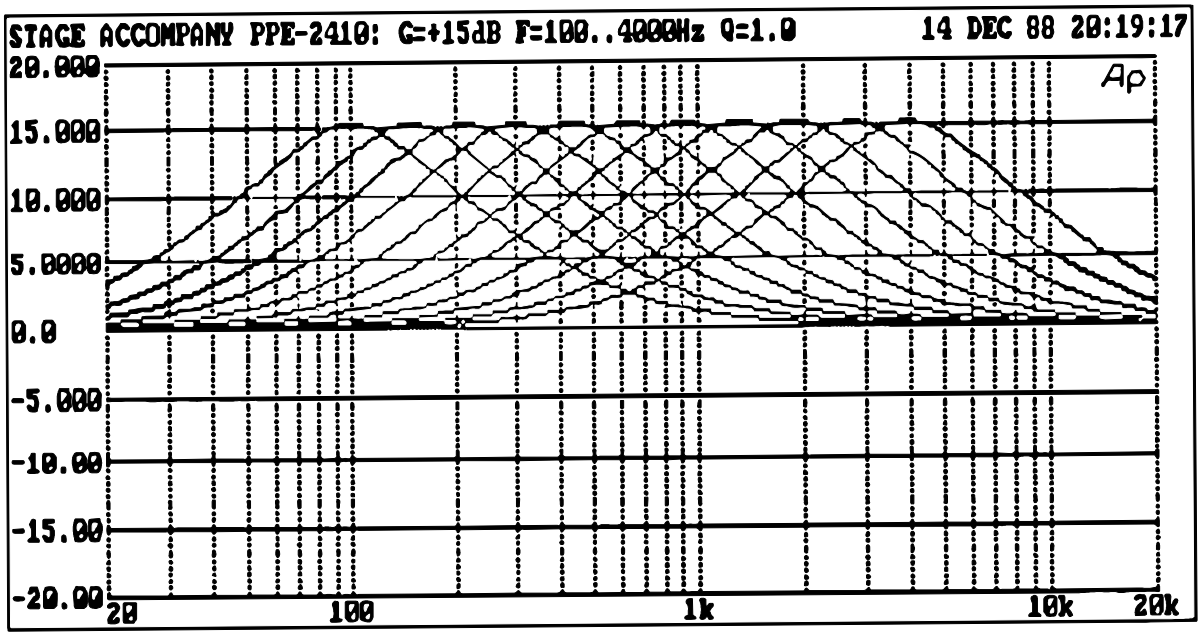

Figure 10-3 Amplification = +15 dB, F = 600 Hz, variable Q-factor.

Various settings

The curves in figure 10-4 were made at a constant amplification and attenuation of 15 dB and a constant central frequency of 600 Hz. The following series of Q-factors is shown; 0.3, 0.5, 0.7, 1.1, 1.7, 2.6, 4.1, 6.3, 9.7 and 15.0.

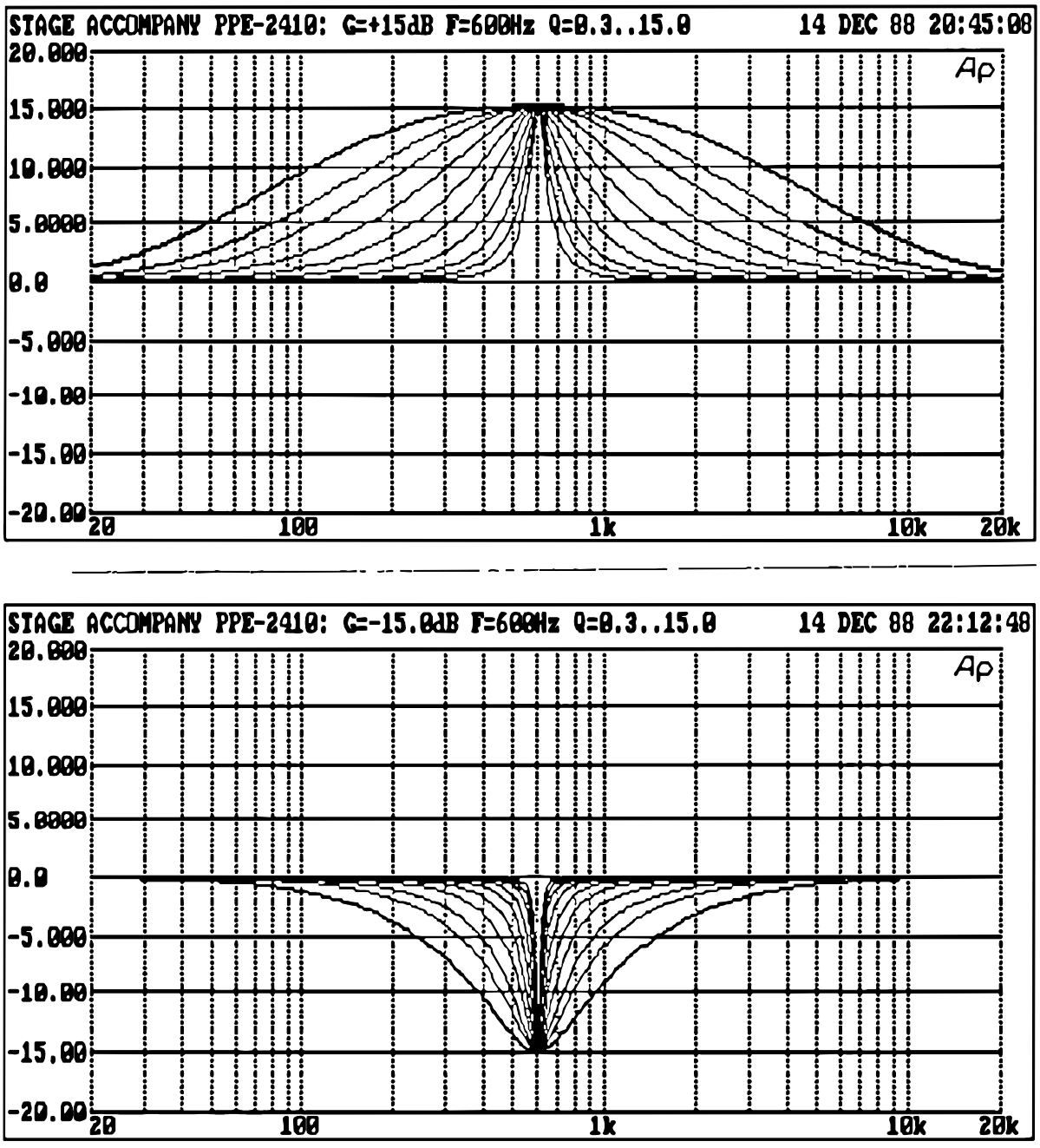

Figure 10-4 Amplification = +/- 15 dB, F = 600 Hz, variable Q-faktor.

The curves in figure 10-5 were made at a constant central frequency of 600 Hz and a constant Q-factor of 1.0. The amplification/attenuation varied from -15 dB to +15 dB in steps of 5 dB.

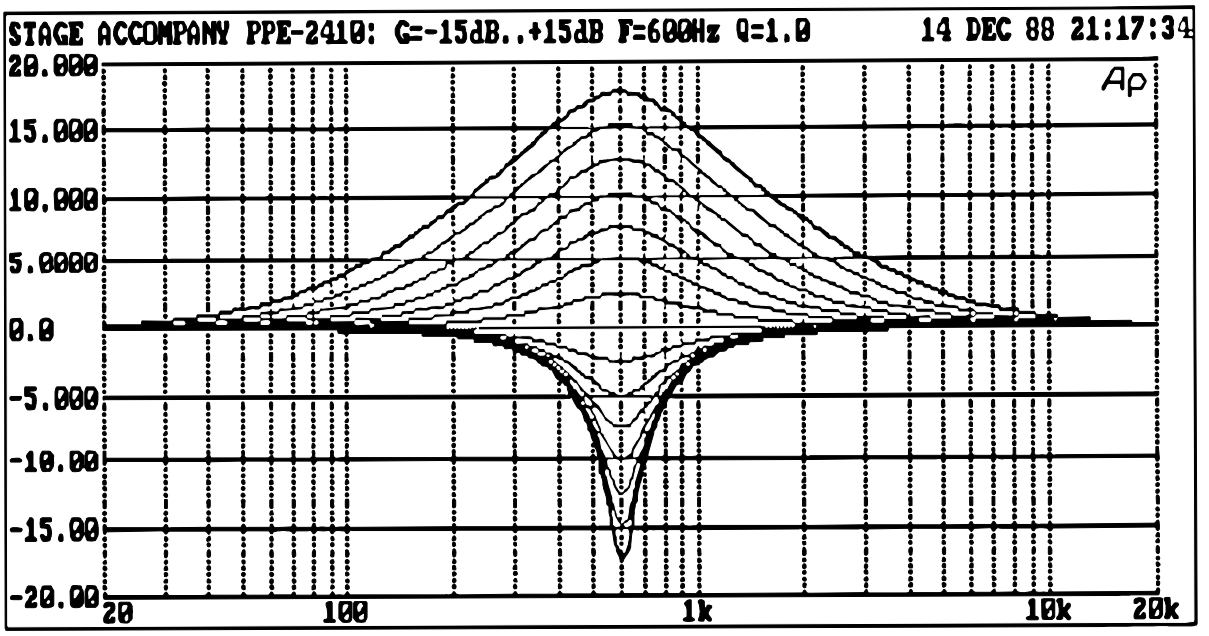

Figure 10-5 "Constant-Q" curves, F = 600 Hz, Q = 1.0.

The PPE 2410 contains so-called "constant-Q" filter sections which are generally used in parametric equalisers. The attenuation curves of these sections are much narrower than the amplification curves. They are therefore ideal for the prevention of feedback in PA installations. The narrow attenuation curves ensure that neighbouring frequencies are virtually unaffected.

The figure shows that the attenuation curves are not mirror images of the amplification curves. However the Q-factor in the amplification mode is the same as the Q-factor in the attenuation mode. This is a result of the fact that the Q-factor is defined using the frequencies where the gain is 3 dB less than the maximum. In the attenuation mode, the maximum is 0 dB. The -3 dB frequencies therefore lie on the -3 dB line (see also figure 9-1 on page 9.1).

Various settings

The sections which are generally used in graphic equalisers are called "reciprocal peaking" filter sections. The Q-factor of these sections is not constant in the attenuation mode, and is much lower than the Q-factor of the corresponding amplification mode.

11 Parallel and Series Configurations of the Filters

The design of an equaliser can be based on one of two configurations: the parallel or the serial configuration.

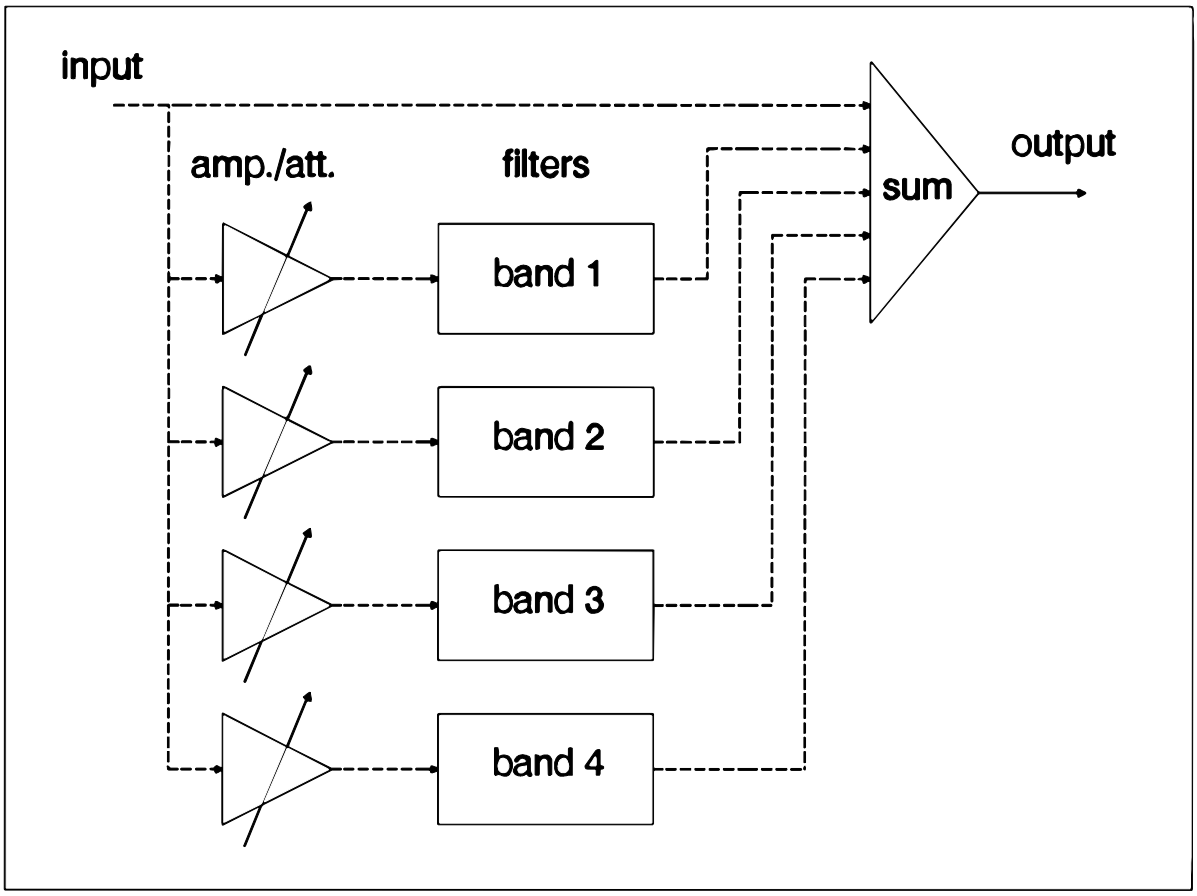

Figure 11-1 Parallel filter configuration.

The parallel configuration is illustrated in figure 11-1. The input signal is supplied to all filters. The filtered signals are added to or subtracted from the original signal to a certain degree. This configuration is most commonly used because of its simplicity and excellent signal to noise ratio.

A disadvantage of this configuration is that the output signals of the filters affect each other when they are added to or subtracted from the original signal. This results in frequency curves that would not be expected on the basis of the programmed parameters. Furthermore, it is not possible to adjust several bands to the same frequency to make the attenuation greater than that for a single band.

The serial configuration is illustrated in figure 11-2. The input signal is supplied only to the filter of the first band. The filtered signal is added to or subtracted from the original signal to a certain degree. The resulting signal is then supplied to the second band. The second, third and fourth bands work in the same way as the first band.

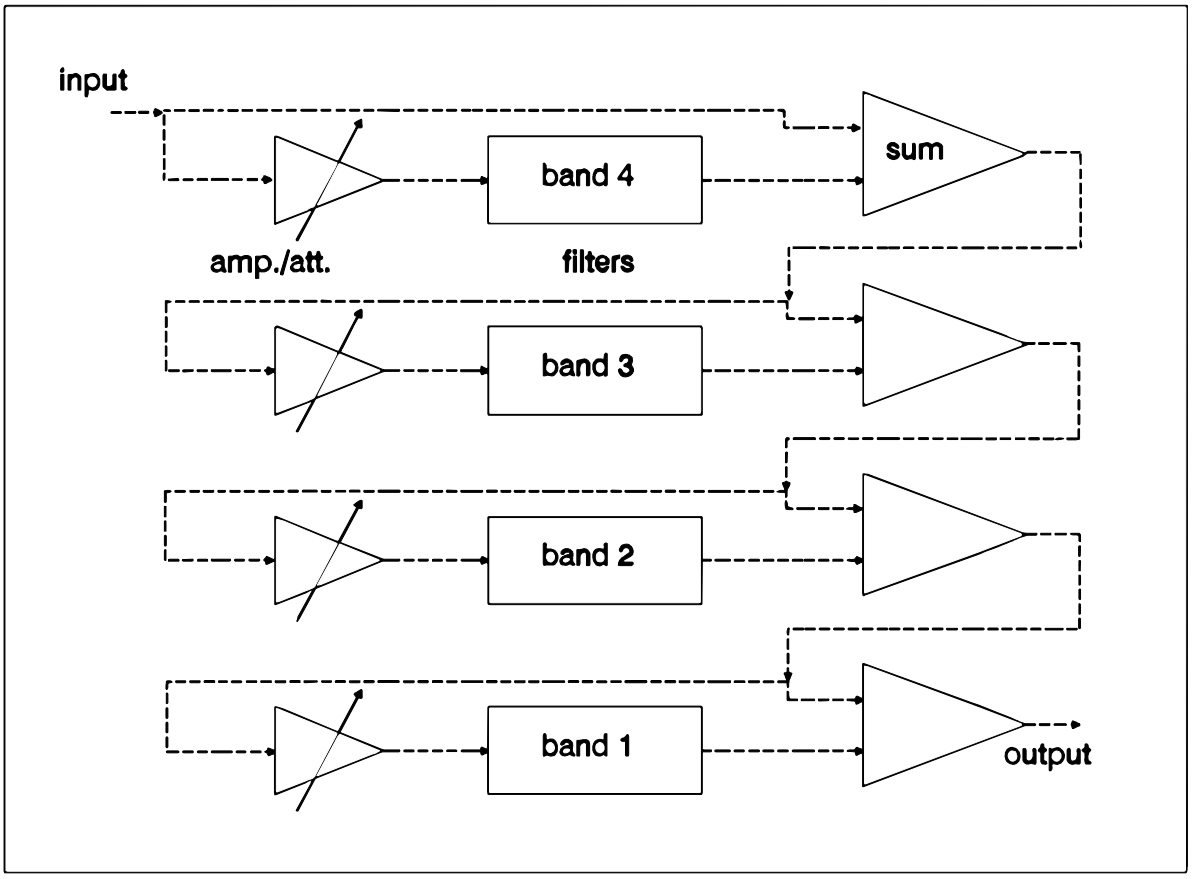

Figure 11-2 Serial filter configuration.

The output signals of the filters are not summed, and as a result they do not influence each other. Every band has a range of -19.5 dB to +19.5 dB. It is therefore possible to set the central frequencies of two bands to identical values. The amplifications and/or attenuations will then be summed. In this way it is possible to create "dips" and "peaks" of more than 60 dB!

PPEs with an ID code from 2 to 91 have a parallel configuration. PPEs, with an ID code greater than 91, have a serial configuration. Users of a PPE with a parallel configuration may install a serial configuration and vice versa. For detailed information, contact your Stage Accompany dealer.

NOTE: If two bands with equal, but opposite amplification/attenuation are set to the same frequency and same Q-factor, the result is NOT zero! This is because the amplification curve at a certain Q-factor is not the same as the attenuation curve at that Q-factor. For more information, see page 9.1.

Figure 11-3 provides an example of this. The amplification of band 1 is +15 dB. The central frequency is 404 Hz. The Q-factor is 1.0. Band 2 has the same settings as band 1, except that it has a attenuation of -15 dB.

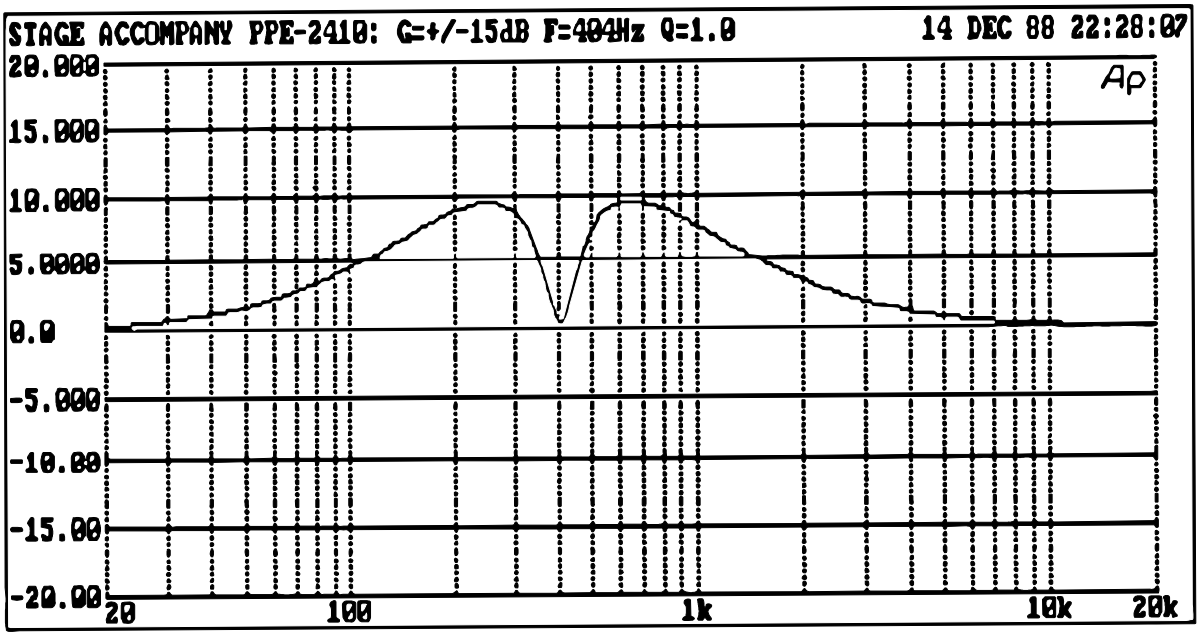

Figure 11-3 The result of identical amplification/attenuation on two channels.

12 Technical Specifications

Maximum input level:	+20 dBm (reference 0 dBm = 0.775 V)
Maximum output level:	+20 dBm
Extra input amplification:	0 dB, +10 dB, +20 dB
Input impedance:	24 kOhms each leg (30 kOhms unbalanced)
Output impedance:	25 Ohms each leg (50 Ohms unbalanced)
Frequency range:	20 Hz - 20 kHz, -0.25 dB 10 Hz - 200 kHz, -2 dB (see figure 12-1)
Signal/noise ratio:	> 90 dB, 10 Hz - 100 kHz (see figure 12-2), typically 100 dB @ 1 kHz
Common mode suppression:	> 80 dB, 10 Hz - 100 kHz (see figure 12-3), typically 90 dB @ 1 kHz
Channel separation:	> 80 dB, 10 Hz - 100 kHz (see figure 12-4), typically 90 dB @ 1 kHz
Total harmonic distortion: THD (+ 10 dBm)	< 0.005%, 10 Hz - 100 kHz (see figure 12-5) typically 0.003% @ 1 kHz
Intermodulation distortion: IMD (+ 10 dBm)	< 0.01%, 2 kHz - 20 kHz (see figure 12-6)
Transient intermodulation distortion: TIM (+ 10 dBm)	< 0.005% @ 15 kHz
Slew rate:	7 V/us

Specifications

stage accompany Release date: 28-03-89

Maximum boost/cut level:	+/- 19.5 dB (per band)
Q-factor:	minimum 0.3, maximum 15.0
Central frequency range:	band 1: 20 Hz - 600 Hz band 2: 60 Hz - 2000 Hz band 3: 200 Hz - 8000 Hz band 4: 600 Hz - 20000 Hz
Remote control:	SAnet (Stage Accompany network) MIDI (Musical Instruments Digital Interface)
Mains supply:	110 V/220 V/240 V AC 50 Hz/60 Hz
Consumed power:	50 VA
Weight:	8.6 kg
Housing:	19 inch rack mount, 3 units high, 32.5 cm deep (without connectors)

Specifications

stage accompany Release date: 28-03-89

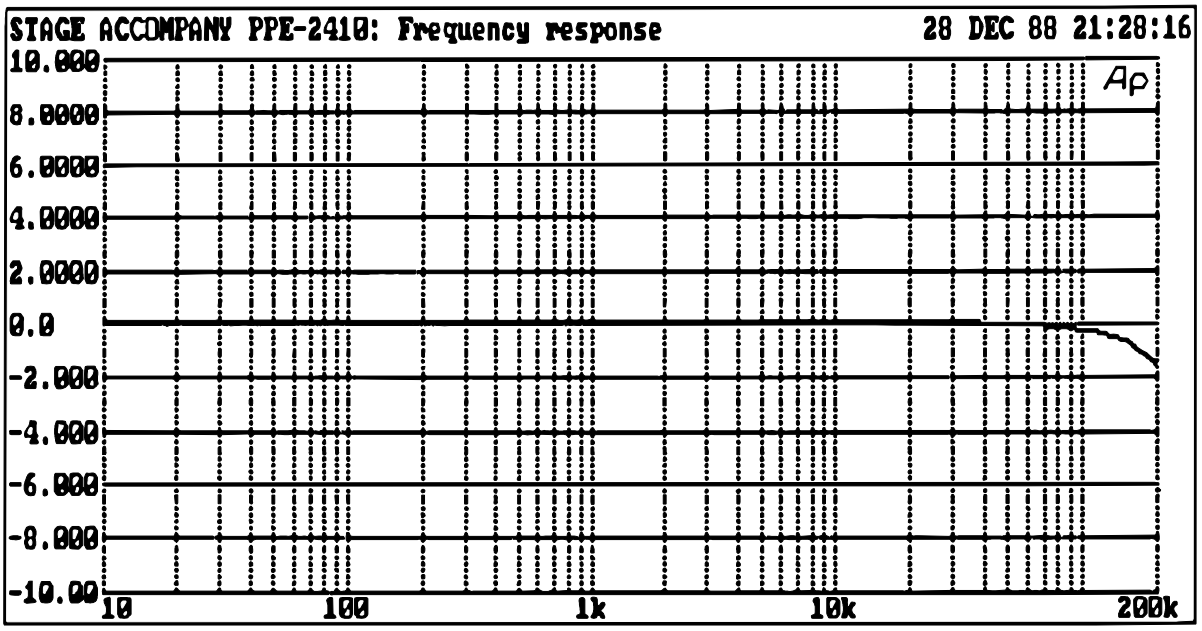

Figure 12-1 Frequency range 10 Hz - 200 kHz.

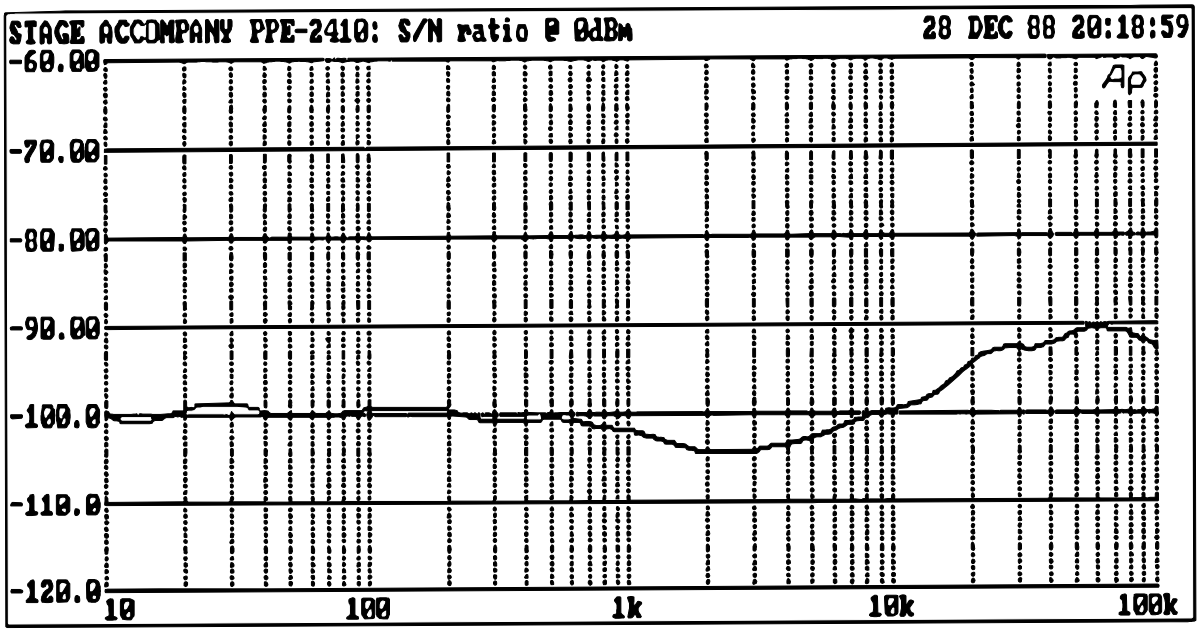

Figure 12-2 Signal/noise ratio, 10 Hz - 100 kHz.

Specifications

stage accompany Release date: 28-03-89

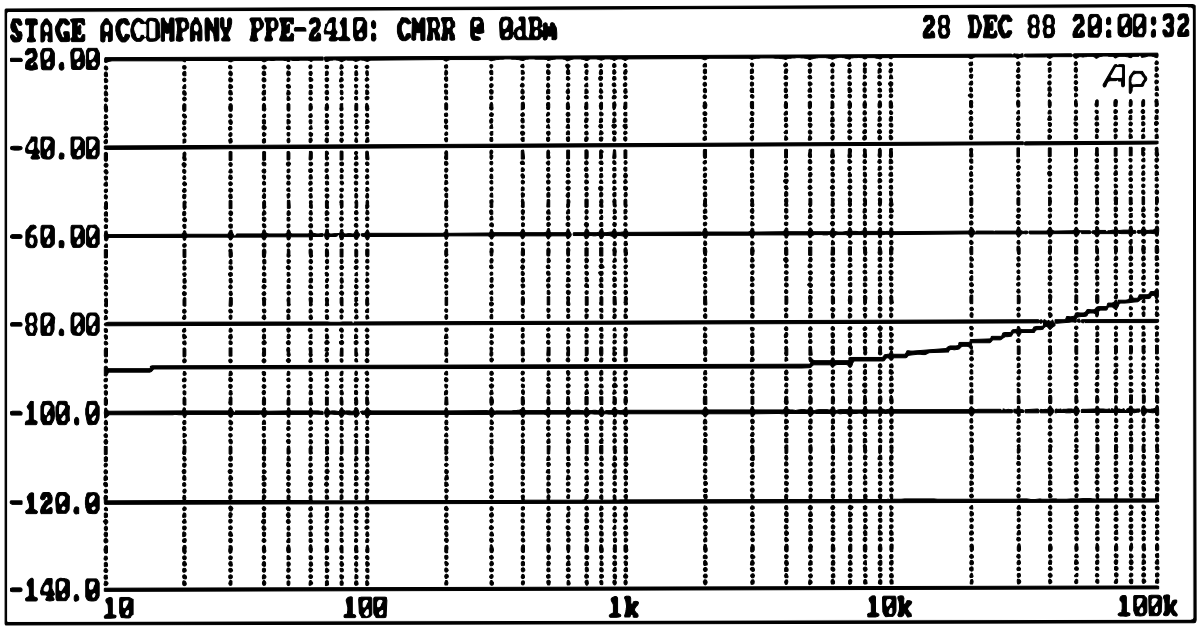

Figure 12-3 Common mode suppression, 10 Hz - 100 kHz.

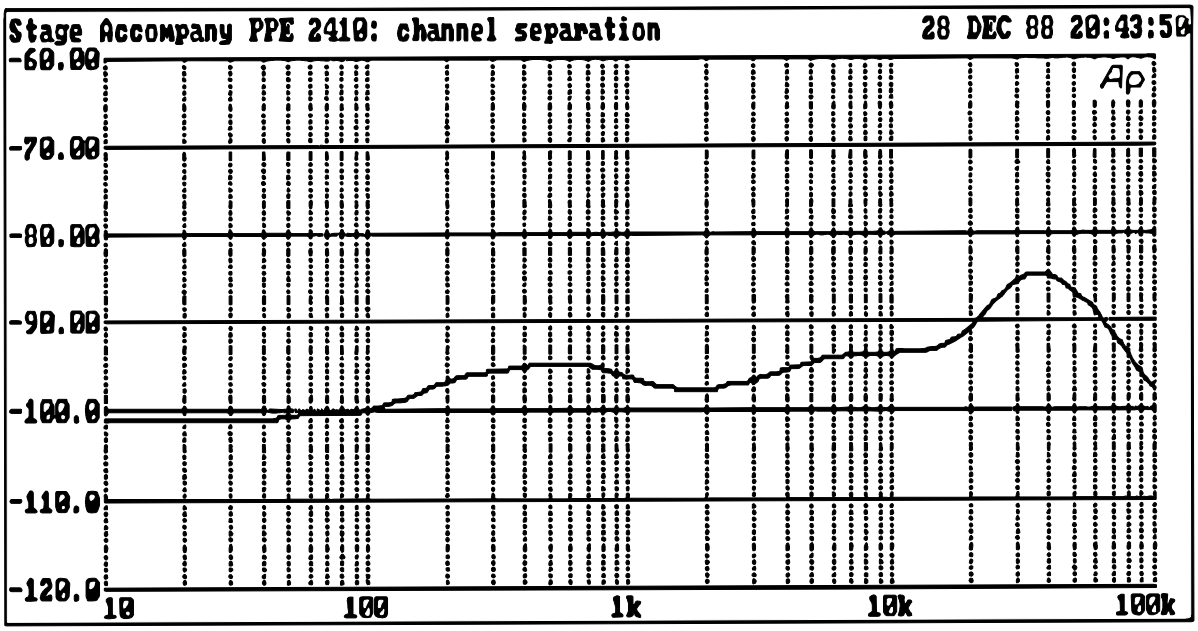

Figure 12-4 Channel separation, 10 Hz - 100 kHz.

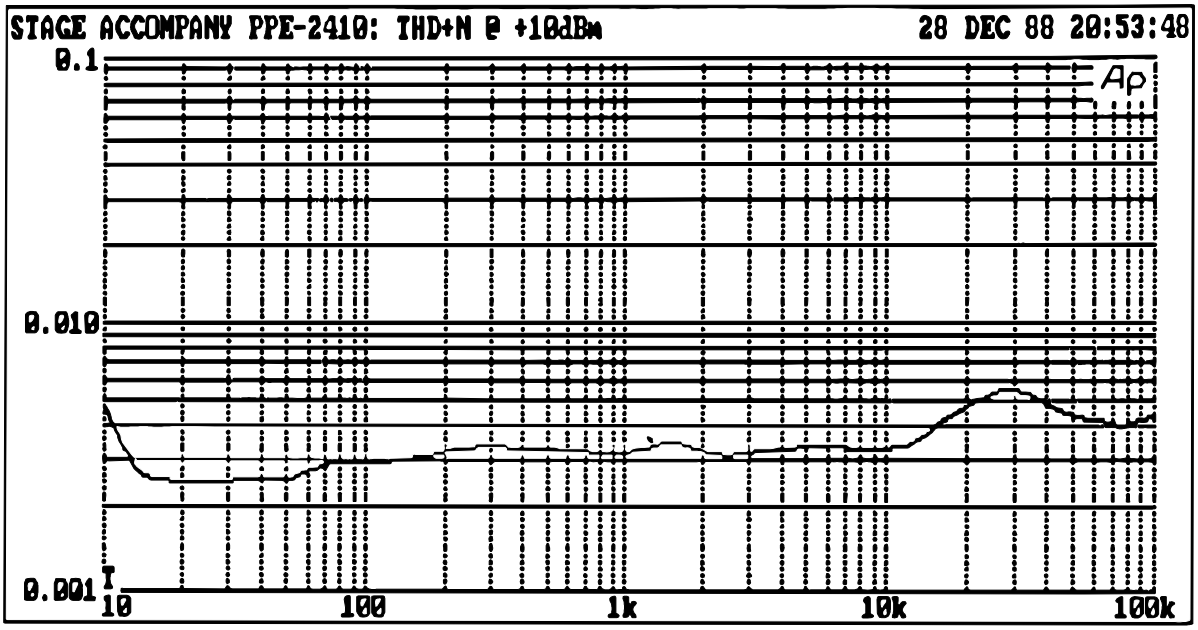

Figure 12-5 Total harmonic distortion, 10 Hz - 100 kHz.

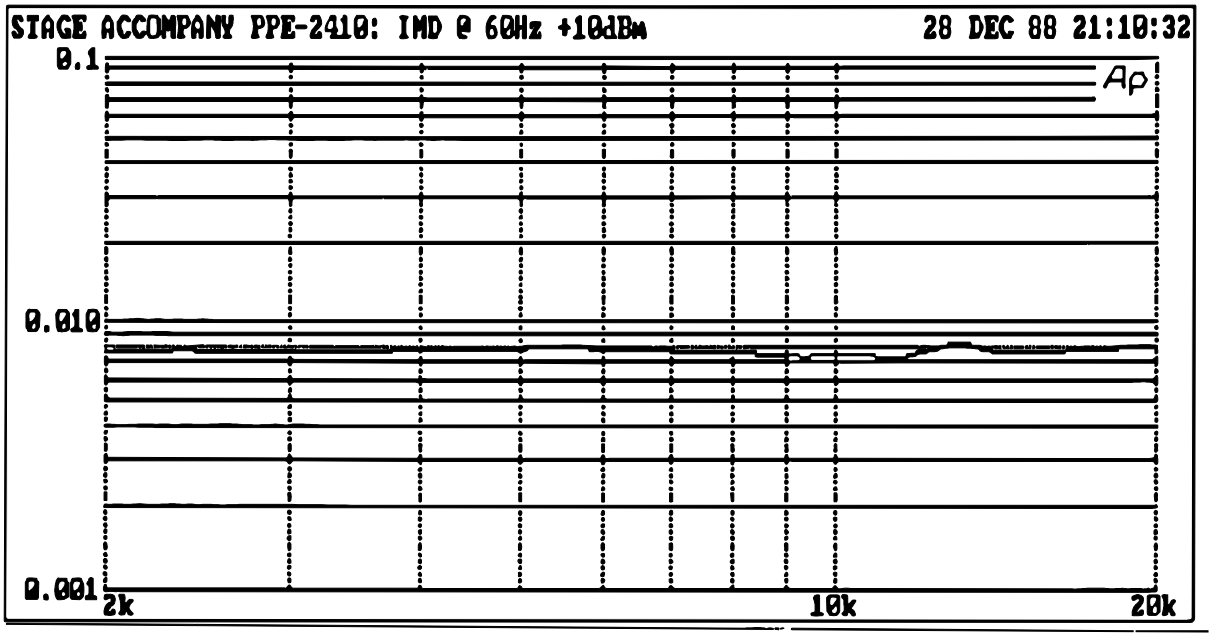

Figure 12-6 Intermodulation distortion, 2 kHz - 20 kHz.

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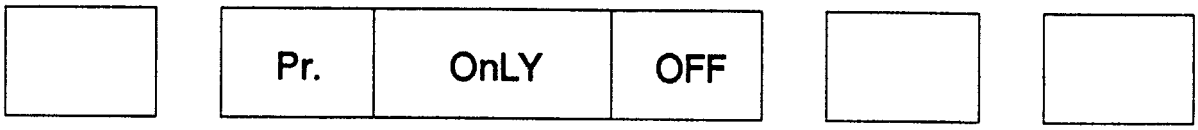
13 Security Functions

This Chapter contains the information about the following security functions:

- Presets-only mode adjustment
- Leveller adjustment
- Resetting the <LOCK> and <LOCK CODE>

13.1 "Presets Only Mode" Adjustment

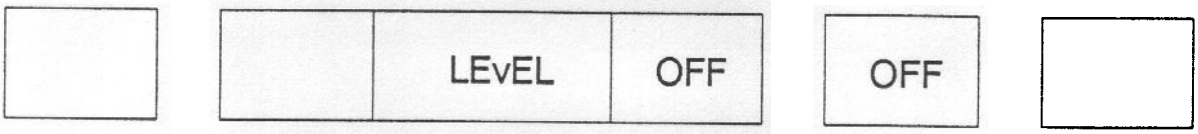
Press numeric key "5" of the keypad for one second until the display shows:



Use the <Q-FACTOR> <UP> and <DOWN> keys to switch the presets only function on or off as desired. However, to do this, you must also press both EQ IN/OUT keys at the same time as you press one of the <Q-FACTOR> keys. Press <STORE> to preserve any alternation or press <RECALL> to quit.. For a detailed description of the presets only mode, see paragraph 7.2.

13.2 Leveller Adjustment

Press numeric key "6" of the keypad for one second until the display shows:



The leveller ranges from 0 dBm to +15 dBm in steps of 1 dBm. In the OFF position, the leveller does not function. The other positions show the output voltage at which the leveller will start working. When setting the function, the <OUTPUT LEVEL> display will flash to indicate that the leveller is active. Detailed information about the functioning of the leveller can be found in paragraph 7.3.

Use the <Q-FACTOR> <UP> and <DOWN> keys to set the leveller as desired. However, to do this, you must also press both EQ IN/OUT keys at the same time as you press one of the <Q-FACTOR> keys. Press <STORE> to preserve any alternation or press <RECALL> to quit.

13.3 Resetting the <LOCK> and <LOCKCODE>

If your PPE 2410 is "locked", and you forgot the locking code, don't despair! Switch the unit off. Press keys 4 and 7 simultaneously, while switching your PPE on again. The PPE is now unlocked and the locking code set to the default value "1".

To unlock the "leveller" lock follow the above procedure but with keys 5 and 6 of the keypad