OverTone PTC-2A

www.overtonedsp.co.uk

Manual

Contents

Section 1 - Introduction

1.1 - What is the PTC-2A?

The PTC-2A VST plug-in for Windows 7 or later comprises a Program EQ emulation based on the much sought-after vintage Pultec EQP units. It models the passive filter circuitry found in such devices, and in addition, the transformer-coupled valve amplifier used to make up the gain after the filters.

1.2 - Main Features:

- VST plug-in for 32 and 64Bit Windows 7 or later and compatible host applications.
- 'Passive' filters model the behaviour of vintage Pultec style EQs, allowing simultaneous low frequency boost and cut via separate controls, to produce the classic EQ curves such units are known for.
- Transformer-coupled valve amplifier emulation.
- Physical Control Weighting replicates the feel of high quality rotary controls.

1.3 System Requirements:

32Bit systems:

A PC Running Windows 7 or later (32Bit) and a compatible VST host application.

64Bit systems:

A PC Running Windows 7 or later [x64] and a compatible VST or VST3 host application.

1.4 - About the manual:

This manual covers the installation and use of the PTC-2A equalizer. Where possible, examples are used, although some aspects of installing and integrating the software with your system will be dependent on the particular combination of operating system and host application you are using and in this case it is only possible to give generic examples that serve to show the principle rather than the actual steps necessary.

Most examples are illustrated with screenshots of the features being discussed.

Section 2 - Installation

2.1 Contents of the zip archive:

Within the zip archive that contained this manual are the installer executables. To install the plug-in, run the installer and it will guide you through the installation process.

2.2 Installing the VST plug-in:

32Bit Windows:

Run **PTC-2A-Win32.exe**
This will install the plug-in suitable for use on 32Bit systems. You can also install the 32Bit plug-in on 64Bit systems provided that you use it with a 32Bit host application or a host which supports 32Bit plug-ins.

64Bit Windows:

Run **PTC-2A-x64.exe**
This will install the plug-in suitable for use on 64Bit systems. The installer will not allow installation of the 64Bit plug-in on 32Bit systems.

The installer will try to discover the location of your VST plug-ins. folder, although if necessary you can browse to a different location - for example if you have several host applications which all have their own VST plug-ins. folders.

64Bit Windows - VST3

Run **PTC-2A-VST3-x64.exe**
This will install the VST3 plug-in suitable for 64Bit systems.

NOTE: VST3 defines specific locations for compatible plug-ins. For Windows this is normally:

`Program Files\Common Files\VST3\[CompanyName]`

The installer will permit other locations however you should use only the installer recommended location for the VST3 plug-ins. unless you are confident of a specific reason for an alternative.

The installer will only install the files necessary for the plug-in to function. It will not install anything else on your computer.

2.3 Uninstalling the plug-in:

To uninstall the plug-in It is recommended to use the

Control Panel -> Add or Remove Programs

option in Windows XP or

Control Panel -> Programs and Features

in Windows 7 and select **Remove** for the PTC-2A

It is not recommended to uninstall the plug-in by manually deleting its files from your VST plug-ins. folder.

Section 3 - Operation

3.1 - The Graphical User Interface:

This is the PTC-2A front panel. You control it by clicking and dragging on the knobs or switches. Click on a knob and drag upwards to increase the value (turning it clockwise) or down to decrease the value (turning it anticlockwise). Some controls may have indents – these manifest themselves as areas in the controls rotation where the reluctance to move is increased such that you have to drag a bit 'harder'. They are intended to behave like real controls which may have a 'click stop' at 0dB for example.
You can also move the controls by placing the mouse pointer over them and using the scroll wheel. In this case the centre indent has no effect.

3.2 - Physically Weighted Controls

To improve the feel of the controls, and make them behave more as hardware equivalents do, the control knobs have been given a small amount of physical 'inertia'. This weighting does not affect the 'law' of the control, only the way it responds to mouse movement. When you begin to drag on a control, or change direction, its 'gearing' will be at a higher resolution (which also helps to locate more precise settings). As you continue to drag the control, it will become more closely geared to the mouse movement, meaning that you can still make significant control changes without large and awkward movements of the mouse.

As the controls are operated their value will be displayed in the status bar above the front panel. If at any time you need to know a control's setting, just click on the control and its value will appear in the status bar.

Double Clicking on a control will reset it to its 'default' position.

3.3 - The Controls

Similar to some of the original vintage hardware EQs, the PTC-2A has a slightly unusual control layout. The EQ can be thought of in separate sections, a low frequency shelf, a high-mid peak and a high frequency shelving attenuator. These sections are described in detail as follows:

1. Low Frequency Shelf - LF Boost:

The Boost control on the left side of the front panel controls the amount by which the low frequencies are boosted relative to the rest of the signal. This is adjustable over a range of 0dB to approx 13.5 dB dependent on the other control settings. In a similar way to the hardware on which it is based, there may be some interaction between the controls.

2. Low Frequency Shelf - LF Attenuate:

The Atten control on the left side of the front panel controls the amount by which the low frequencies are attenuated relative to the rest of the signal. This is adjustable over a range of 0dB to approx -17.5 dB dependent on the other control settings. As previously described, the controls will interact with each other - and this can also be used advantageously to replicate some of the classic boost / cut EQ curves from vintage EQ hardware. This is described in more detail in later sections.

3. Mid-High Peak - Boost:

The amount by which the peak filter boosts the selected frequency range can be adjusted by the 'Boost' control on the right side of the front panel. The peak filter provides approx 0dB to 18dB of boost. It does not provide the ability to attenuate the selected frequencies.
The maximum available boost will depend upon the bandwidth settings, with 18dB available at 'Sharp' and 10dB at 'Broad'.

4. High Frequency Shelf - HF Attenuate:

The HF shelving filter attenuates the high frequencies. The Atten control determines the amount of attenuation, from 0dB to approx -16dB.

5. High Frequency Shelf - Atten Sel:

The frequency at which the HF shelving filter operates can be selected from either 5KHz, 10KHz or 20KHz. As it is a shelf filter, all frequencies above the selected setting will be attenuated by the amount set with the Atten control. It is not possible to boost the HF frequencies.

6. Power Switch:

This is the EQ power switch. With the switch in the 'Off' position, and the lamp extinguished, the EQ **and** the tube amplifier stage will be completely out of circuit and the audio will pass through unaffected. With the switch in the 'On' position, and the lamp illuminated, the EQ will operate normally. In this mode, the tube amplifier remains in circuit even when the EQ filters are bypassed ('EQ In' switch set to off).

7. Mid-High Peak - Frequency:

The peak filter centre frequency can be set using the 'High Frequency' switch on the right of the front panel. This is adjustable in steps from 3KHz (KCS) to 16KHz (KCS). The setting of this control also affects the available bandwidth of the filter, with slightly reduced bandwidth available at higher frequencies.

8. Mid-High Peak - Bandwidth:

The bandwidth control determines the width of the mid-high peak filter boost. It is continuously variable from 'sharp' - a narrow peak of approx 1.5 octaves, to 'broad'- a wider peak of approx 2.5 octaves. The exact bandwidth is dependent on the other control settings, particularly the centre frequency.

9. Low Frequency Shelf - LF Frequency:

The Low Frequency control selects the frequency at which the LF Boost and / or Attenuate takes place. As this section is a shelving filter, all frequencies below the selected setting are boosted or attenuated. The control is not continuously variable, instead it has four fixed positions. In keeping with original vintage EQ front panels, the control settings are described in Cycles per second (equivalent to Hz).

10. EQ In:

This is the EQ bypass switch. With the switch in the 'On' position, the filters will be in the signal path and affecting the output. With the switch in the 'Off' position the filters will be out of the signal path.
Note that vintage hardware EQs such as the Pultec units often had passive filters, followed by a transformer-coupled valve amplifier stage to make up for the signal loss in the filter. Even with the switch in the Off position, the valve amplifier stage remained in circuit. While this does not affect the signal level, it does mean that there is still a bit of extra valve 'warmth' even with the EQ switched out.

NOTE: When applying large amounts of boost to the signal, be careful not to damage amplifiers, speakers (or ears) this is not a 'fault' with the equalizer, it is just something you can do if you turn things up too loud. Any equalizer – digital or analogue - has the potential to cause low or high frequency transients that are far in excess of the nominal average level of the signal. As with all signal processors, its best to start with small amounts of boost or cut and add more gradually.

3.4 - Demo Mode:

When the plug-in is first added to a channel / buss, the following screen will appear if it has not been activated by a valid key. This indicates the plug-in is running in demo mode and will run with some restrictions. To obtain the full functionality you will need to purchase a valid activation key from the OverTone website at: http://www.overtonedsp.co.uk

Section 4 - Presets

4.1 - Preset Configurations

The PTC-2A has twelve factory presets, designed to provide a guide to some of the more common combinations of control settings. For a more detailed insight into using the PTC-2A, refer to sections 5, 6 and 7.

Factory Preset 1 - Low-end Trick 30Hz	Using the LF Boost and Atten controls simultaneously to emulate the signature 'low-end trick' - LF Frequency set to 30Hz.
Factory Preset 2 - Low-end Trick 60Hz	Using the LF Boost and Atten controls simultaneously to emulate the signature 'low-end trick' - LF Frequency set to 60Hz.
Factory Preset 3 - Low-end Trick - Bright 30Hz	Low-end trick at 30Hz with some HF Boost / Atten applied to brighten up the top end.
Factory Preset 4 - Low-end Trick - Bright 60Hz	Low-end trick at 60Hz with some HF Boost / Atten applied to brighten up the top end.
Factory Preset 5 - Air 10KHz	HF Boost at 10KHz to add 'Air' with a small amount of HF Atten to stop the sound becoming harsh.
Factory Preset 6 - Air 12KHz	HF Boost at 12KHz to add 'Air' with a small amount of HF Atten to stop the sound becoming harsh.
Factory Preset 7 - Warm Vox	100Hz LF Boost for extra vocal 'warmth'
Factory Preset 8 - Bass Direct	Gentle LF Boost, 3KHz mid-range presence combined with 5KHz HF Attenuation
Factory Preset 9 - Fat 1A	Classic EQP-1A LF Boost and Atten provide solid yet articulate bass. While the HF Atten further fattens up the sound.
Factory Preset 10 - Tube Presence	Mid boost at 4KHz enhances the transformer-coupled tube amplifier emulation
Factory Preset 11 - Mix Presence	Gentle mid boost for cutting through the mix.
Factory Preset 12 - Smooth	Gentle LF Boost combined with HF attenuation for a smooth rounded tone.

4.2 - Preset Selectors

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In addition to the preset selector options provided by the host application, the plug-in has a pair of preset selector buttons to the right of the status display. Pressing the right or left arrows will step up or down through the factory presets and the four user preset memories.

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The selector buttons step through factory presets **which cannot be overwritten**. If you wish to modify a factory preset, select it, use the front panel controls to adjust the settings as required, then save it as a new preset using the host application's preset load and save options.

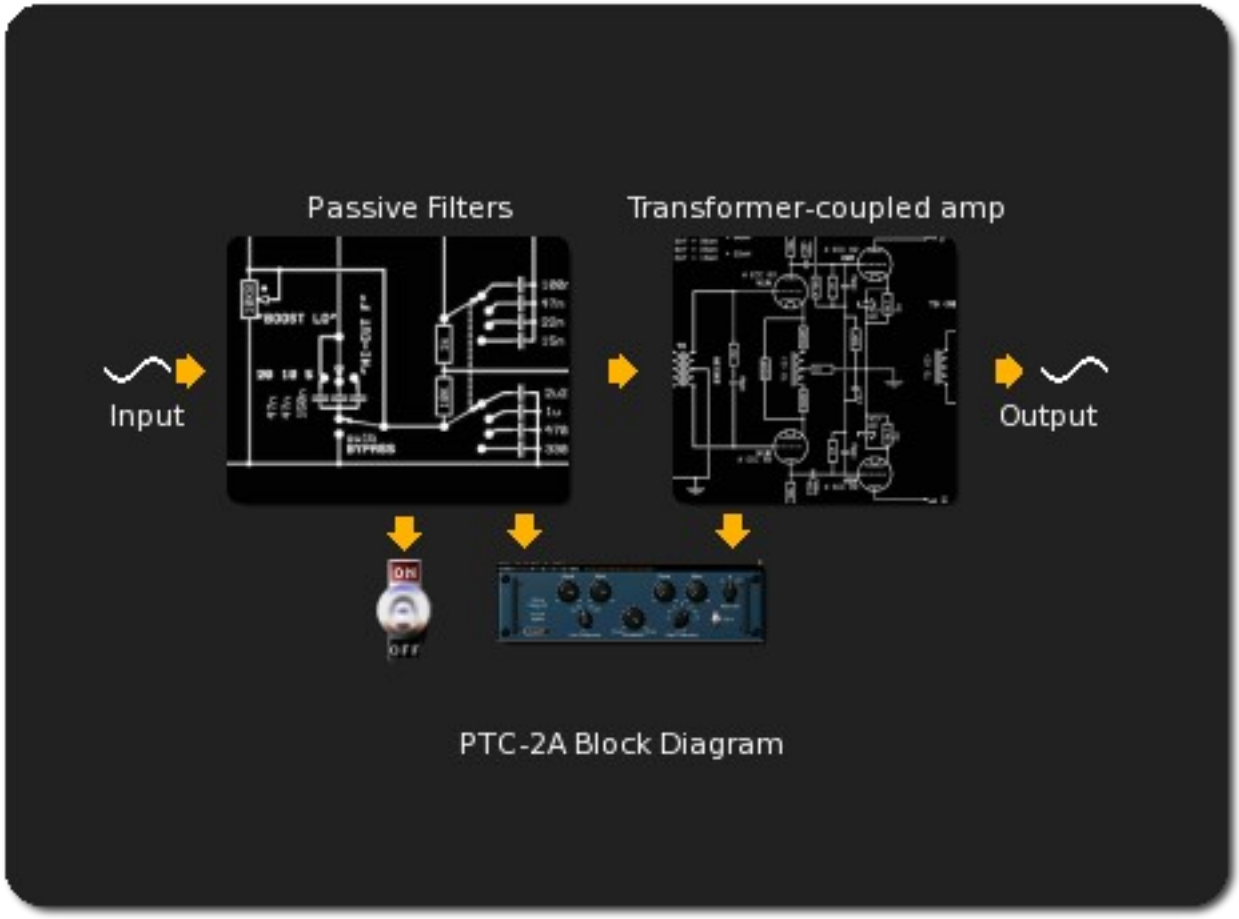
4.3 - Status Display

Clicking on the Info button will cause the status display to show the current version number. Normally the status display will show the control parameter values as they are adjusted, or the preset names when they are selected.

Section 5 - Block Diagram

5.1 PTC-2A DSP Functional Blocks:

The following diagram shows the processing contained in the PTC-2A:



Audio entering the PTC-2A passes through a passive filter emulation, which provides the low frequency boost and attenuate, mid-high frequency peak and the high frequency attenuation, adjusted via the front panel controls.

After the filters, a transformer-coupled valve amplifier emulation provides a small amount of transformer saturation at very high signal levels, and a slight modification of the frequency response - as would happen in equivalent analogue hardware.

As can be seen in the diagram, just as in original Pultec style EQs, the bypass switch affects only the passive filters which means the amplifier stage is always in circuit. This does not affect the output level, as the unit is designed to be zero loss, but it does confer the 'valve sound' on the audio even with the effect switched out.

Section 6 - Using the PTC-2A

The PTC-2A emulates some of the best qualities of vintage Pultec EQs. In keeping with this, the front panel controls may be a little unusual if you are used to more modern designs. The EQ consists of three filter sections:

6.1 Low Frequency Boost and Attenuate:

This shelving filter provides up to 13.5dB of boost and 17.5dB of attenuation at low frequencies. Importantly, the boost and attenuate are adjusted by two separate controls. This allows you to **boost and attenuate the low frequencies at the same time.**
This technique is covered in more detail later, but it is worth mentioning that although this was something the original Pultec manual specifically warned the user **not** to do, it has since become well known as one of the best uses of these units.

6.2 Mid / High Peak filter:

The Peak filter can only be set to boost (from 0dB - flat - to approx 18dB). It operates over the mid to high range of frequencies selected by the seven position High Frequency switch. The amount of boost can be continuously varied as can the bandwidth. The filter is a constant bandwidth design, and in this emulation uses innovative DSP technology to provide a de-cramped response. This means that the filter emulates the behaviour of an analogue design more accurately than conventional digital filters, without requiring CPU intensive upsampling.

Note that the maximum available boost will depend upon the bandwidth setting, as it does in the original Pultec style EQ. With the bandwidth set to 'sharp' the maximum mid / high boost is 18dB. With the bandwidth set to 'broad' the maximum mid / high boost is approx 10dB.

The bandwidth setting also affects the 'law' of the boost control. With the bandwidth set to 'sharp' the boost control is approximately linear with respect to the absolute gain. With the bandwidth set to 'broad' the control is approximately logarithmic with respect to absolute gain.

6.3 High Frequency Attenuate:

The final stage is a high frequency shelf filter. The frequency can be selected by the three position Atten Sel switch, and the amount of attenuation can be continuously varied. It is not possible to boost the high frequencies with this filter. To accomplish that, use the Mid-High Peak with a broad bandwidth and high e.g. >10KHz frequency setting.

Section 7 - Examples

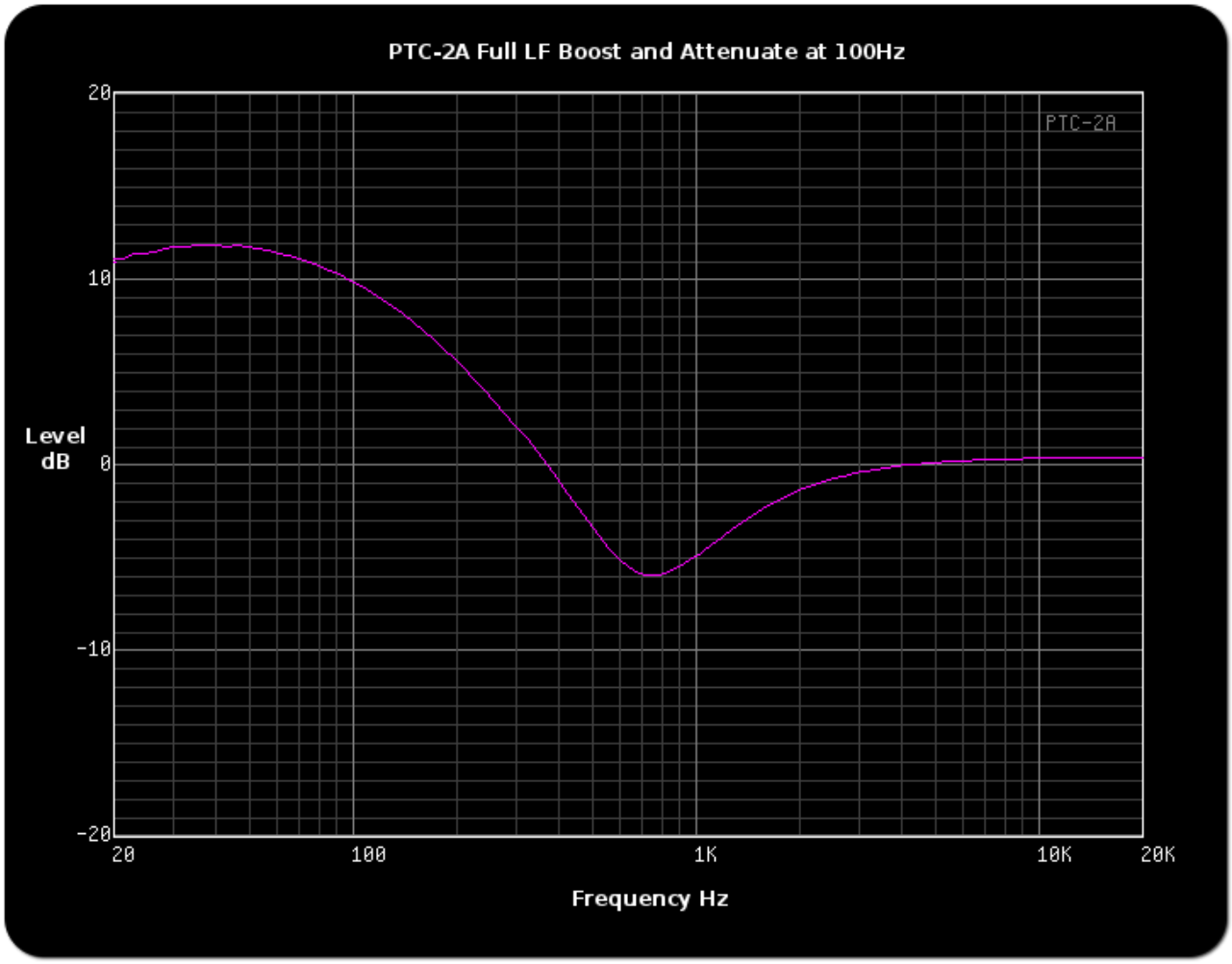
7.1 The Pultec 'low-end trick':

Perhaps the best known use of this style of EQ is to get the sought-after bass boost made possible by **boosting and attenuating the low frequencies at the same time.** It may seem as though the boost and attenuate will cancel and the result will be back to 'flat'. However, the important detail is that, in part due to the slight difference in maximum boost and attenuate levels (13.5dB compared to 17.5dB) - the frequency response of the boost and attenuate filters do not match. The attenuate is slightly higher in frequency, even though there is only one front panel frequency selector control.

7.2 Boost and Attenuate at the same time:

The combined effect of the boost and attenuate filters is to produce a bass boost, and then gradually a slight dip in the frequency response in the low-mid range as the low frequency attenuate control is also increased.
The result is that with equal amounts of boost and attenuate, the bass is given more 'kick' but at the same time 'tightened up' by the mid-range dip, which stops it becoming 'Muddy'. This is the classic Pultec 'low-end trick'.

The following graph shows the EQ frequency response to uniform white noise with full LF boost and attenuation at 100Hz. The dip just before 1000Hz can be clearly seen. The roll-off towards 15Hz is due to the output transformer emulation, similar to equivalent analogue behaviour.



Test Signal:

Input Signal :	20Hz - 20kHz swept sine at 0dBFS
Sample Rate :	48kHz

Control Settings:

LF Boost :	10
LF Atten :	10
LF Freq:	100Hz
HF Boost :	0
HF Atten	0

Section 8 - Technical Data

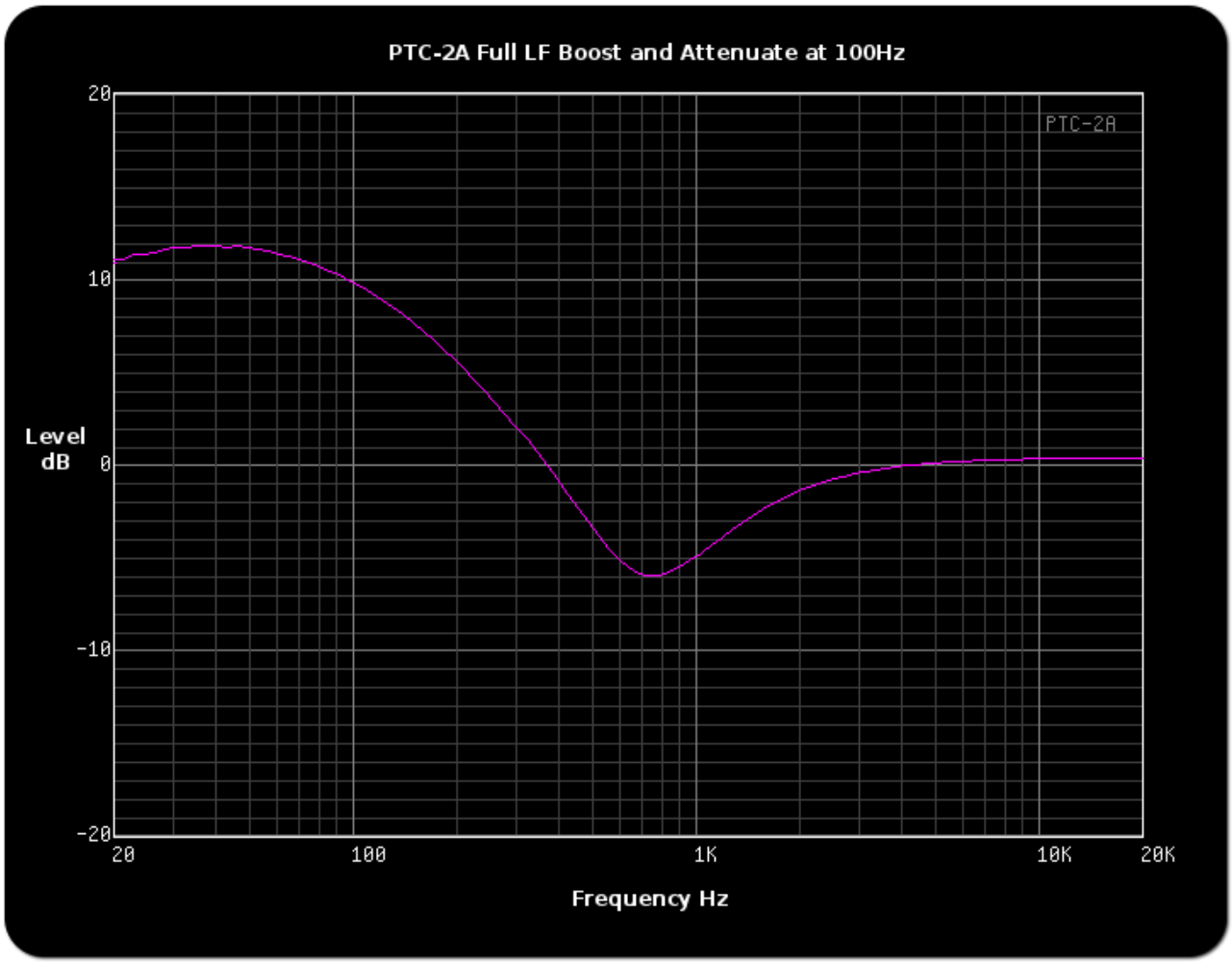
8.1 Technical Specifications

Frequency response (bypassed):	20Hz to Fs/2 where Fs is the sample rate.
Internal Processing:	32bit Floating Point, 64Bit DSP coefficients and storage.
Reference Level:	1.0f is assumed to represent 0dBFS
Dynamic range:	Limited only by internal processing resolution (32bit Floating Point) and progressive limiting after 24dBFS due to transformer saturation emulation.
Maximum LF Boost:	13.5dB Dependent on control interaction.
Maximum LF Attenuate:	17.5dB Dependent on control interaction.
Maximum Mid / High boost (sharp bandwidth):	18dB.
Maximum Mid / High boost (broad bandwidth):	10dB
Maximum HF Attenuate:	16dB.
Filter Slope	6dB / Octave.
Filter Types:	LF Shelf (Boost / Attenuate) De-cramped Mid - High Peak filter HF Shelf (Attenuate)
Frequency Ranges:	LF Shelf: 20Hz, 30Hz, 60Hz and 100Hz. Mid: 3kHz, 4kHz, 5kHz, 8kHz, 10kHz, 12kHz, 16kHz. HF Shelf: 5kHz, 10kHz and 20kHz.
Filter Bandwidth(Mid):	1.5 - 2.5 Octaves. Dependent on control interaction.

Section 9 - Measured Performance

9.1 Full LF Boost and Attenuate:

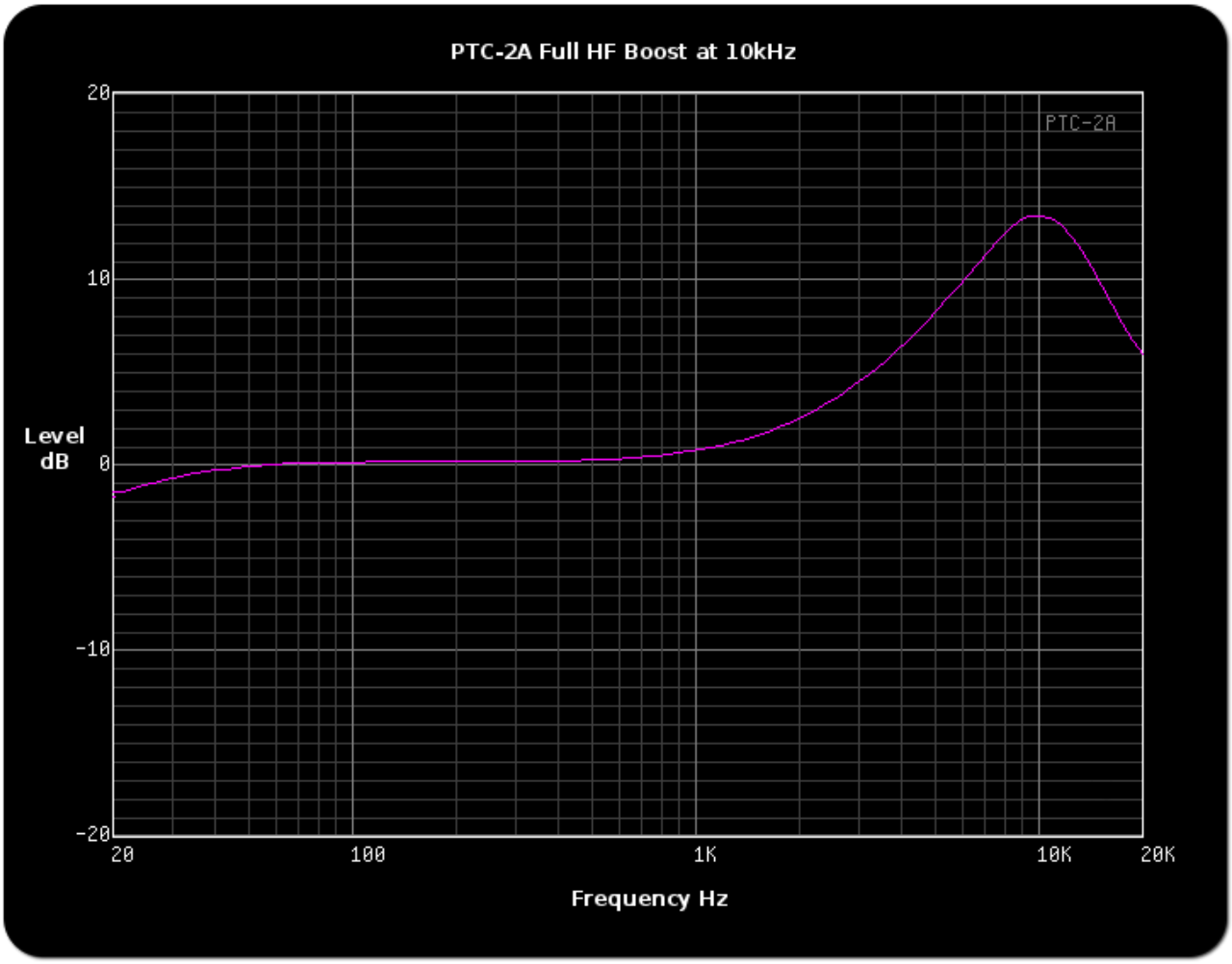
Graph showing measured response to 20Hz - 20kHz swept sine. The roll-off at 15Hz due to the transformer emulation can also be seen.



Test Signal:	
Input Signal :	20Hz - 20kHz swept sine at 0dBFS
Sample Rate :	48kHz
Control Settings:	
LF Boost :	10
LF Atten :	10
LF Freq:	100Hz
HF Boost :	0
HF Atten	0

9.2 Measured Response - Mid / High Boost:

Graph showing measured response to 20Hz - 20kHz swept sine. Analogue filter modelling algorithms ensure a natural analogue style filter response.



Test Signal:

Input Signal :	20Hz - 20kHz swept sine at 0dBFS
Sample Rate :	48kHz

Control Settings:

LF Boost :	0
LF Atten :	0
HF Freq:	10kHz
HF Boost :	10
HF Atten	0

Section 10 - Spare Parts and Service

With regular care and maintenance your new PTC-2A equalizer is designed to give long and reliable service. Spare parts and service updates can be downloaded from:

http://www.overtonedsp.co.uk

Always ensure it has adequate ventilation and is kept free from dust. **Always use genuine replacement parts.** For service and support information contact:

support@overtonedsp.co.uk

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