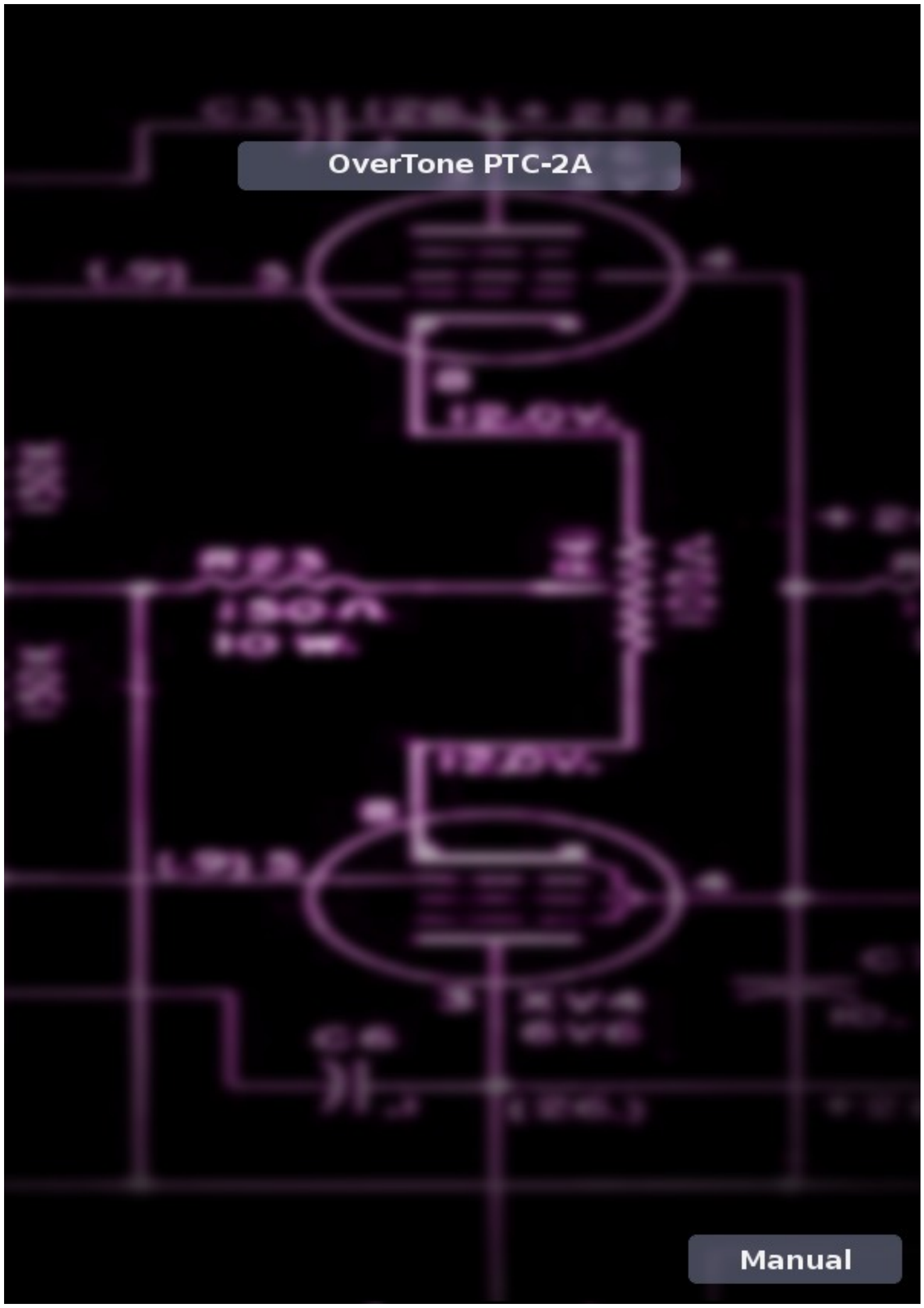
OverTone PTC-2A



Manual

Contents

Section 1 - Introduction

1.1 - What is the PTC-2A?

The PTC-2A is a Vintage Program EQ based on the much sought after Pultec EQP units. It models the passive EQ 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:

- Linux VST plugin or standalone JACK application for 32 and 64Bit Linux PCs running a compatible host application or the JACK audio server.
- 'Passive' filters model the behaviour of Pultec style EQs, allowing simultaneous boost and cut of the low frequencies via separate controls, to produce the classic low frequency EQ curves of these units.
- Transformer-coupled valve amplifier emulation.
- Physical Control Weighting replicates the feel of high quality rotary controls.

1.3 System Requirements:

An X11 compatible linux distribution and a Linux VST compatible host application, and / or the JACK audio server.

1.4 - About the manual:

This manual covers the installation and use of the PTC-2A equaliser. 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 linux distribution and desktop / window manager 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.

1.5 - Conventions used in the manual:

Access to menu items are shown as follows:

`Menu -> Item -> Item`

A `Monospaced font` Is used to illustrate commands as they are typed on the command line.

Section 2 - Installation

2.1 Download contents:

Within the folder that contained this manual are two sub-folders (directories). The **x86** directory contains the plugins built for **32Bit systems**, the **x86-64** directory contains the plugins built for **64Bit systems**.

2.2 Installing the plugin:

Select either x86 or x86-64 depending upon CPU type. Within these folders you will find the installer executables.

Run the installer executable(s) by (double) clicking them in a file browser, or launching them from the command line. The installer will prompt you for either your user password or the root / admin password depending upon the authentication method your distribution uses.

The installer will guide you through the installation process. For the standalone JACK applications, the installer will attempt to add a menu / desktop shortcut to the application.

If your distribution requires a different method for creating menu shortcuts, the JACK applications can be started from:

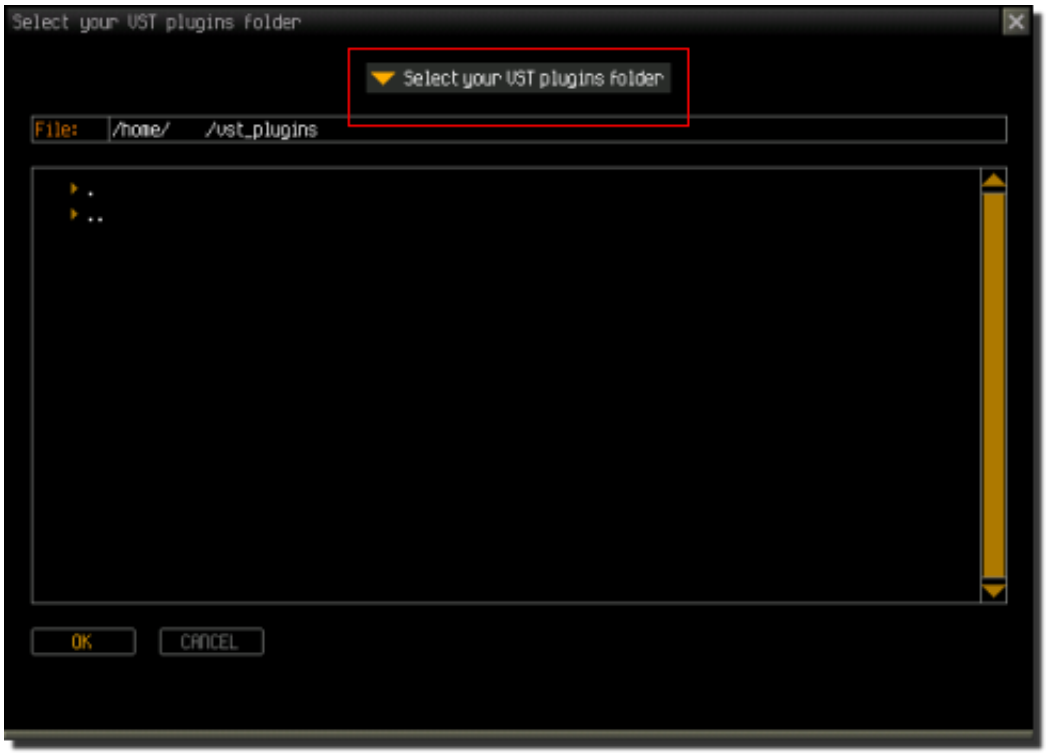
`/opt/overtone-jack-applications/ptc-2a-i686` (For 32Bit)

or

`/opt/overtone-jack-applications/ptc-2a-x86-64` [For 64Bit]

2.3 Selecting the VST plugins location:

For the VST plugin, the installer will unpack the necessary files and then prompt for the location of your VST plugins folder. It is recommended to have a single VST plugins folder, but you can install the plugins to as many different locations as you require (just run the installer again and select a new location).



2.4 Troubleshooting:

The installer(s) are designed to be self-contained and compatible with most linux distributions, if you need to backup the installer, the single executable file(s) should be all you need. However, due to the varied and constantly changing nature of linux distributions, it is possible that the installer may not be compatible with your system configuration. If this happens, follow these steps to isolate the problem or install the plugins manually.

1. Do not run the installer as the root / admin user. If you do, there will be a warning message on the console and the installer will exit. The installer is designed to be run as a normal user and will prompt for a password if required.

2. Do not run multiple instances of the installer at the same time. In order to prevent any contention / corruption of files during the installation, the installer will not start if another instance is already running. If the installer has crashed or exited badly for some reason, you may need to remove any abandoned `acmt-installer-lock` files from `/tmp`

3. The installer uses the `sudo` or `su` authentication methods (the installer itself never gains root or admin permissions on your system). You will need to make sure that either your user name is authenticated in the `/etc/sudoers` file (if your distribution uses `sudo`) or that there is a valid root account (if your system relies on `su`)

4. In some circumstances you may need to mark the installers as "executable" in order for them to be launched. You can normally do this by right-clicking the installer and selecting:

   Properties -> Permissions -> Allow executing file as program

2.5 Manually installing the plugins:

If your system configuration cannot be compatible with the installers, you can install the plugins manually by copying the required files onto your system. You will need to be familiar with command line operations in order to do this.

The plugin binary files are contained in the `plugin_binaries.tar.gz` file within the x86 or x86-64 folders. Extract the archive, and you will find it contains JACK and VST folders.

The JACK folder contains the JACK application executable, the VST folder contains the plugins in Linux VST format.

There is also a README file which details how to copy the required files onto your system.

2.6 Support:

If you are unsure how to install the plugins, or encounter problems during the installation, contact: support@overtonedsp.co.uk

and we will assist with the installation.

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 anti-clockwise). 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 real analogue versions 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:

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 modelled, the PTC-2A controls can interact with each other.

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 will be described in more detail in later sections.

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, it determines that 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 the original Vintage EQ front panels, the control settings are described in Cycles per second (equivalent to Hz).

Mid-High Peak - Bandwidth:

Next is the Peak filter, which can be used to boost the mid to high range frequencies. The Bandwidth control illustrated here determines the width of the peak. 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.

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'

Mid-High Peak - High 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.

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.

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.

EQ In:

This is the EQ bypass switch. With the switch in the 'On' position (illustrated) 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.

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).

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 equaliser, it is just something you can do if you turn things up too loud. Any equaliser – 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 plugin 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 plugin 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

VST2.x
In addition to the preset selector options provided by the host application, the plugin 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.

JACK
The standalone JACK application permits the current state to be saved and reloaded from file. To select a preset file loction, press the preset load or save selector buttons to open a file selector dialogue.

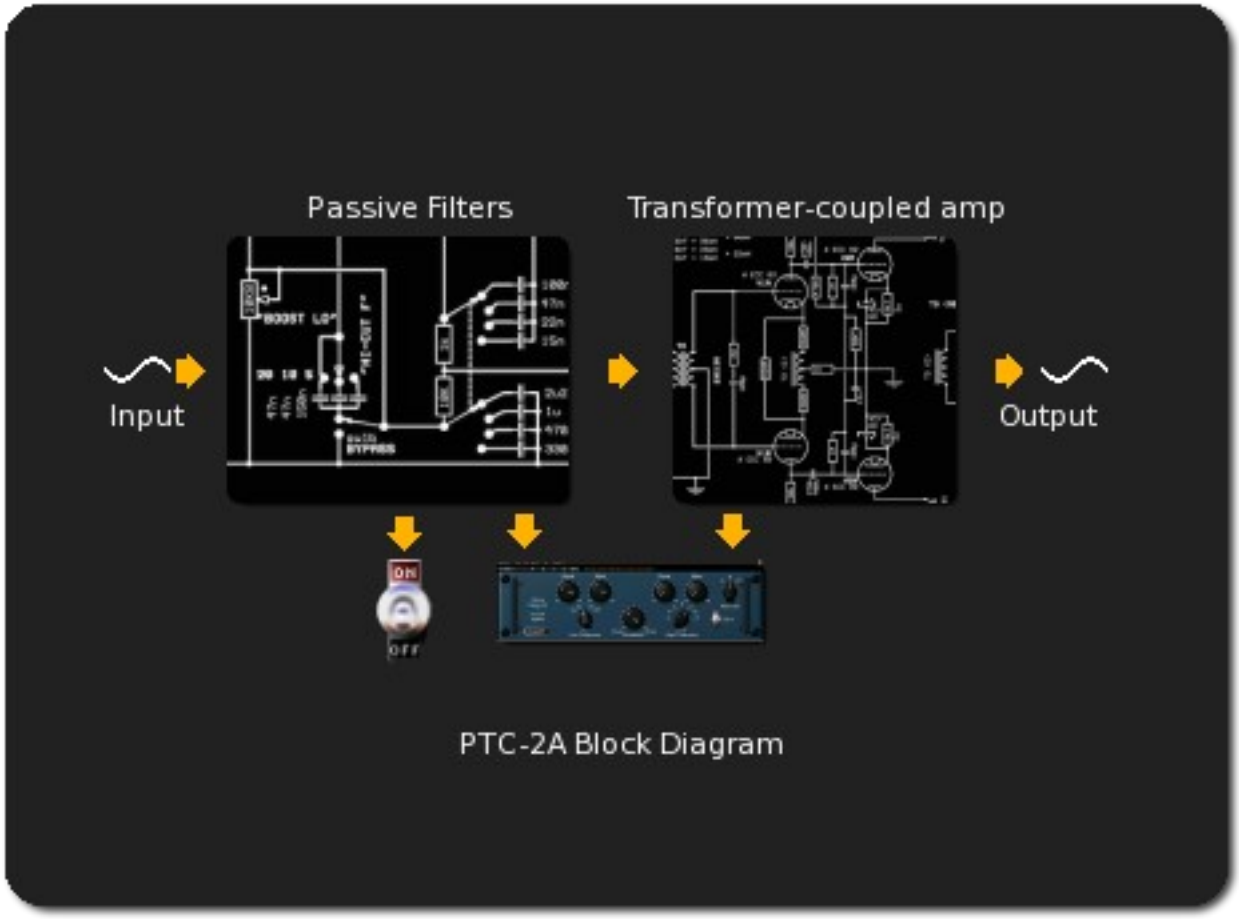
4.3 - Status Display

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

As can be seen in the diagram, just as in an original Pultec style EQ, 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 upsampling.

Note that the maximum available boost will depend upon the bandwidth setting, as it does in the original hardware Pultec 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

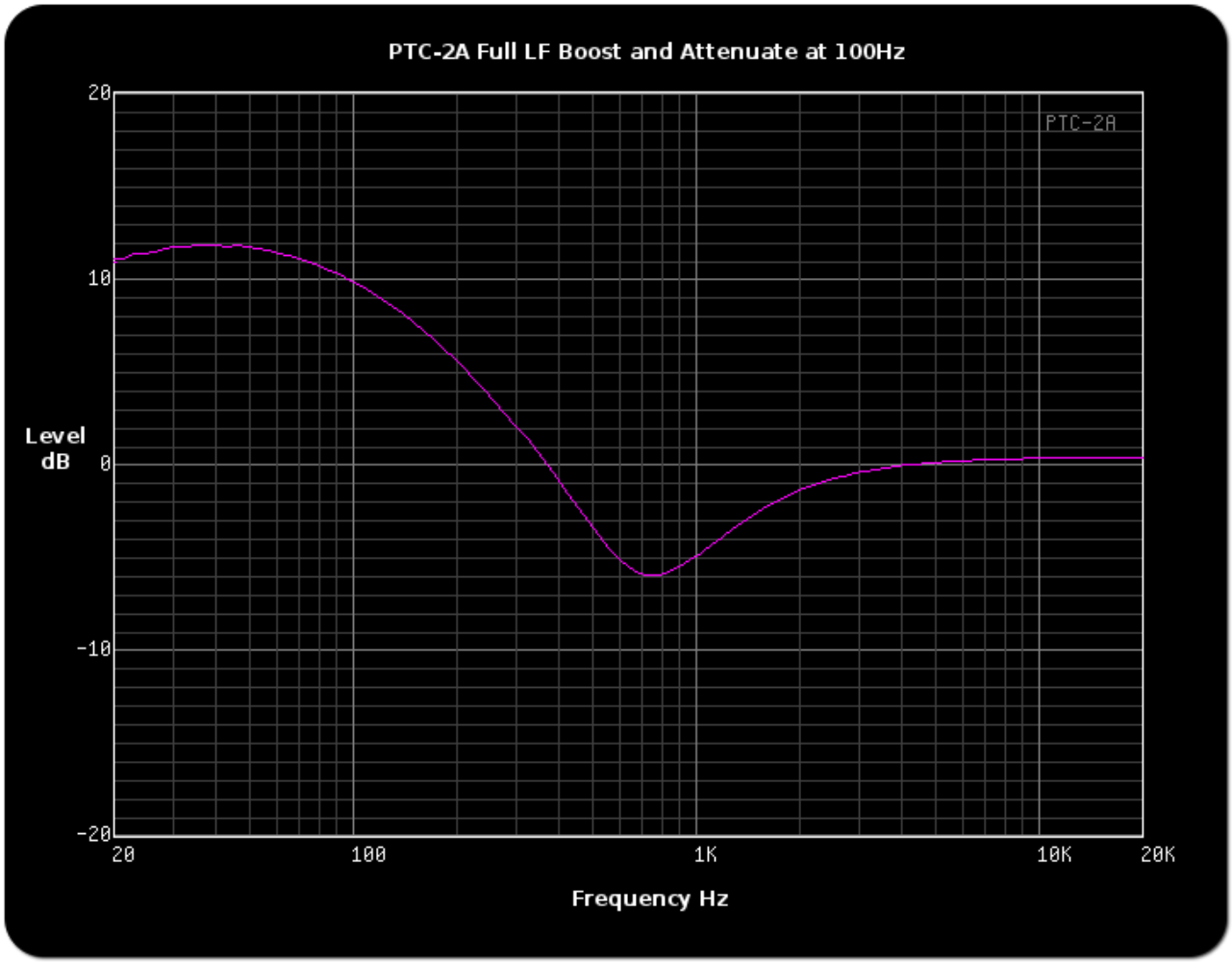
7.1 The Pultec 'low-end trick':

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 and is also characteristic of real hardware.



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

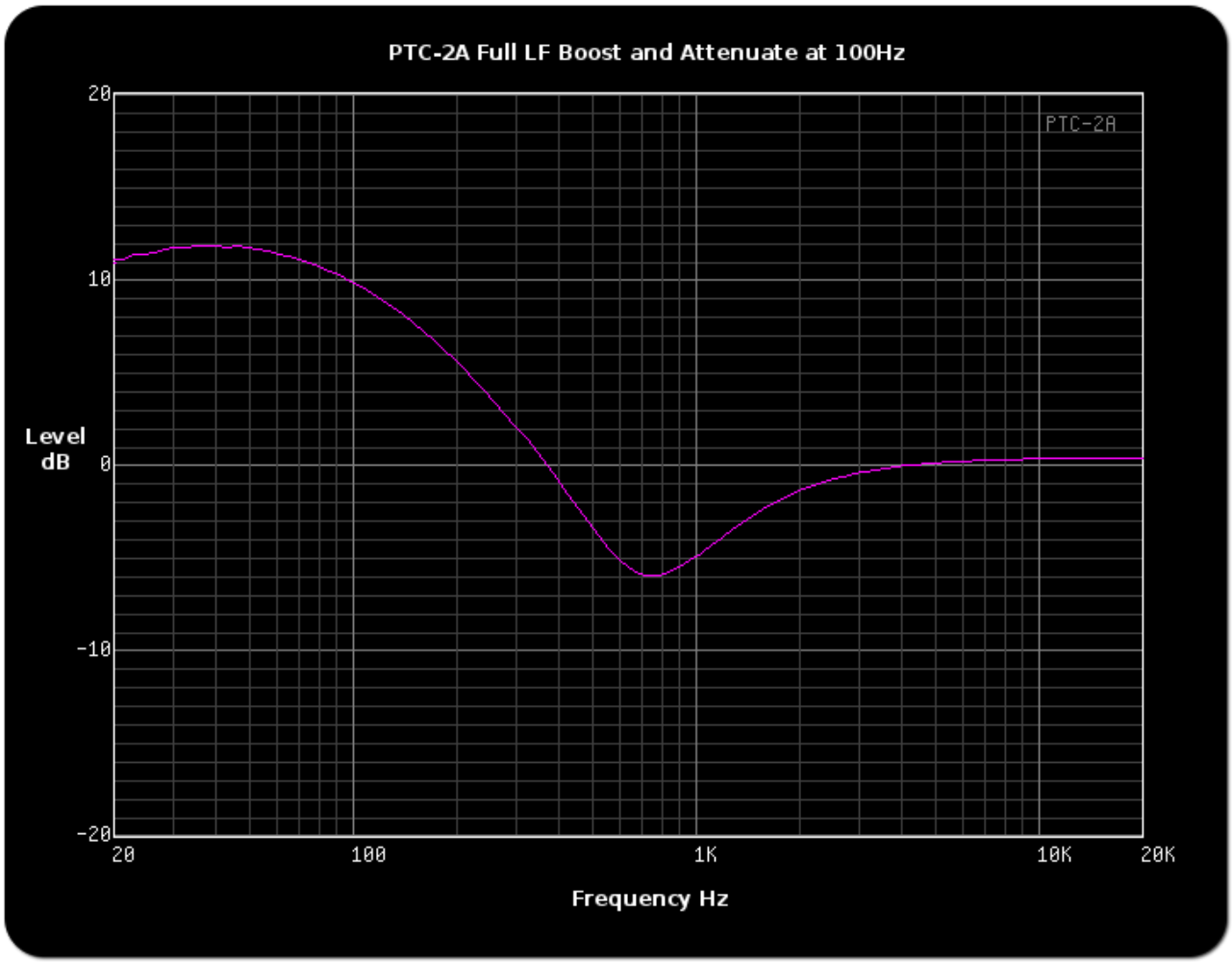
8.1 Technical Specifications

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:

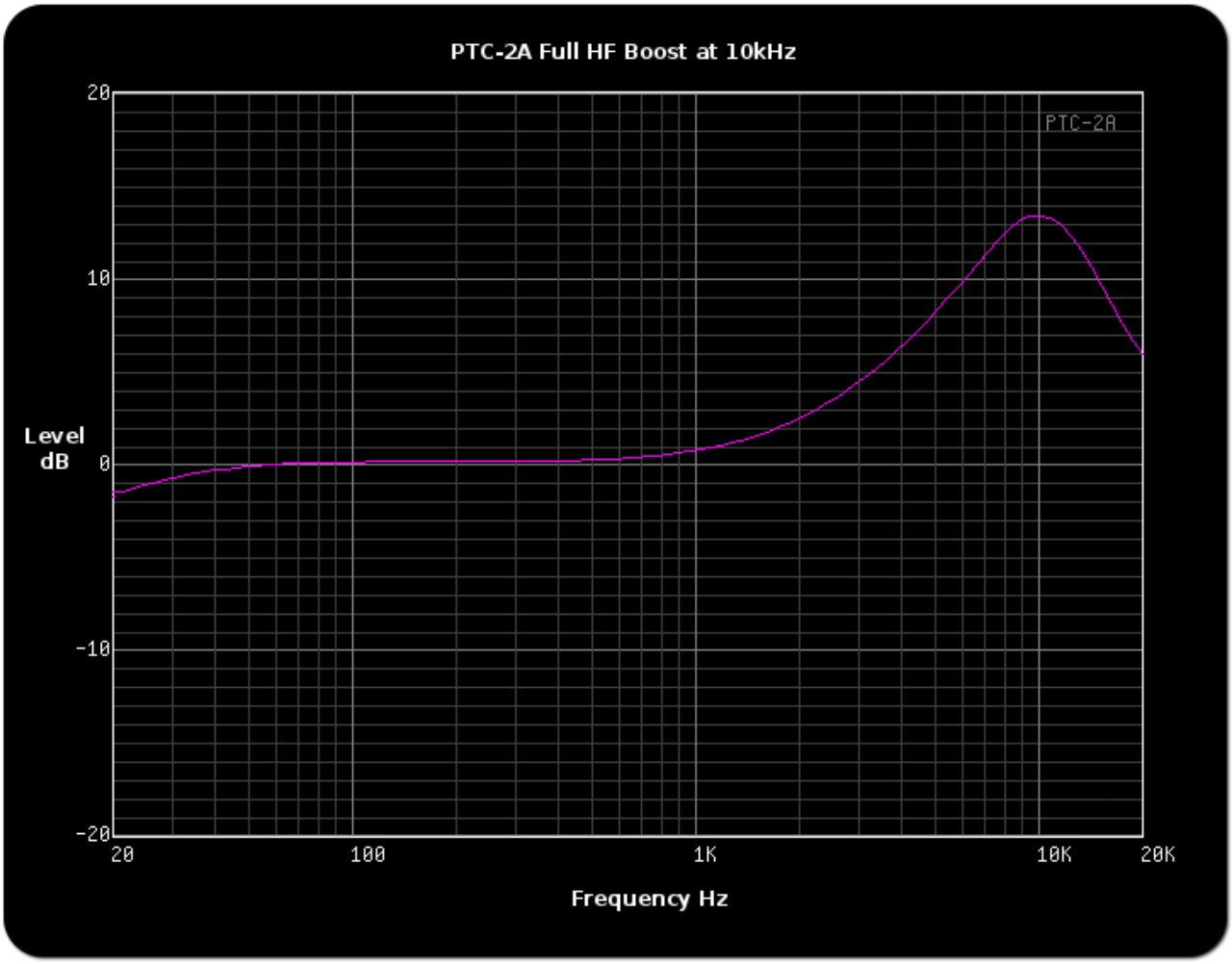
Graph showing measured response to 20Hz - 20kHz swept sine. The roll-off at 15Hz due to the transformer emulation can also be seen.



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 Equaliser 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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