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Section 1 - Introduction

1.1 - What is the ACM-2SA?

The ACM-2SA plug-in for Windows or Linux PCs and compatible audio workstation applications comprises a vintage 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, VST3 and CLAP plug-in for 64Bit Linux PCs 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.
- Modern stylized user interface.
- Transformer-coupled valve amplifier emulation.
- Physical control weighting replicates the feel of high quality rotary controls.

1.3 System Requirements



Windows:

A PC running 64Bit Windows 7 or newer and a VST, VST3 or CLAP compatible host application.



Linux:

An X11 compatible Linux distribution and a Linux VST, VST3 or CLAP compatible host application.

1.4 - About the Manual

This manual covers the installation and use of the ACM-2SA equalizer. Features and operation may vary depending upon your operating system configuration and host application. Where appropriate, examples are also illustrated with screenshots of the features being discussed.

1.5 - Conventions Used

Access to menu items are shown as follows:

Menu -> Item -> Item

A Mono-spaced 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 you will find Windows and Linux folders containing the plug-in built for **64Bit Windows or Linux systems**. Please refer to section 1.3 for system requirements.

2.2a Installing the Plug-In for Windows

Installing the Plug-In for Windows:

Within the Windows folder you will find installers for the VST, VST3 and CLAP plug-ins. The installers will guide you through the steps required to install the plug-ins.

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

Program Files\Common Files\VST3\[CompanyName]

and

Program Files\Common Files\CLAP\[CompanyName]

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

Uninstalling the plug-in:

To uninstall the plug-in It is recommended to use

Control Panel -> Add or Remove Programs

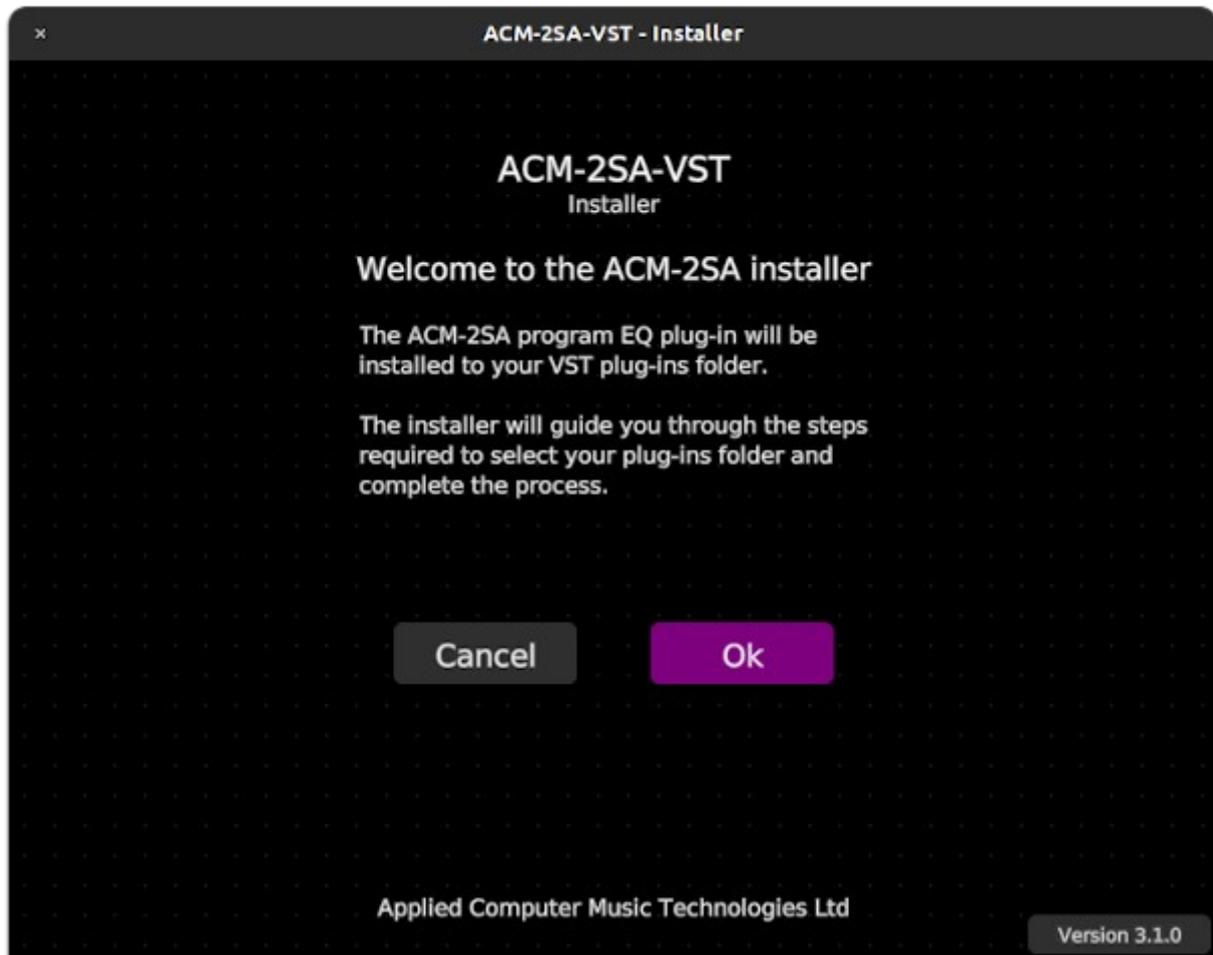
and select **Remove** for the ACM-2SA.

2.2b Installing the Plug-In for Linux

Installing the Plug-In for Linux:

Within the Linux folder, you will find the x86-64 folder containing the installer executable.

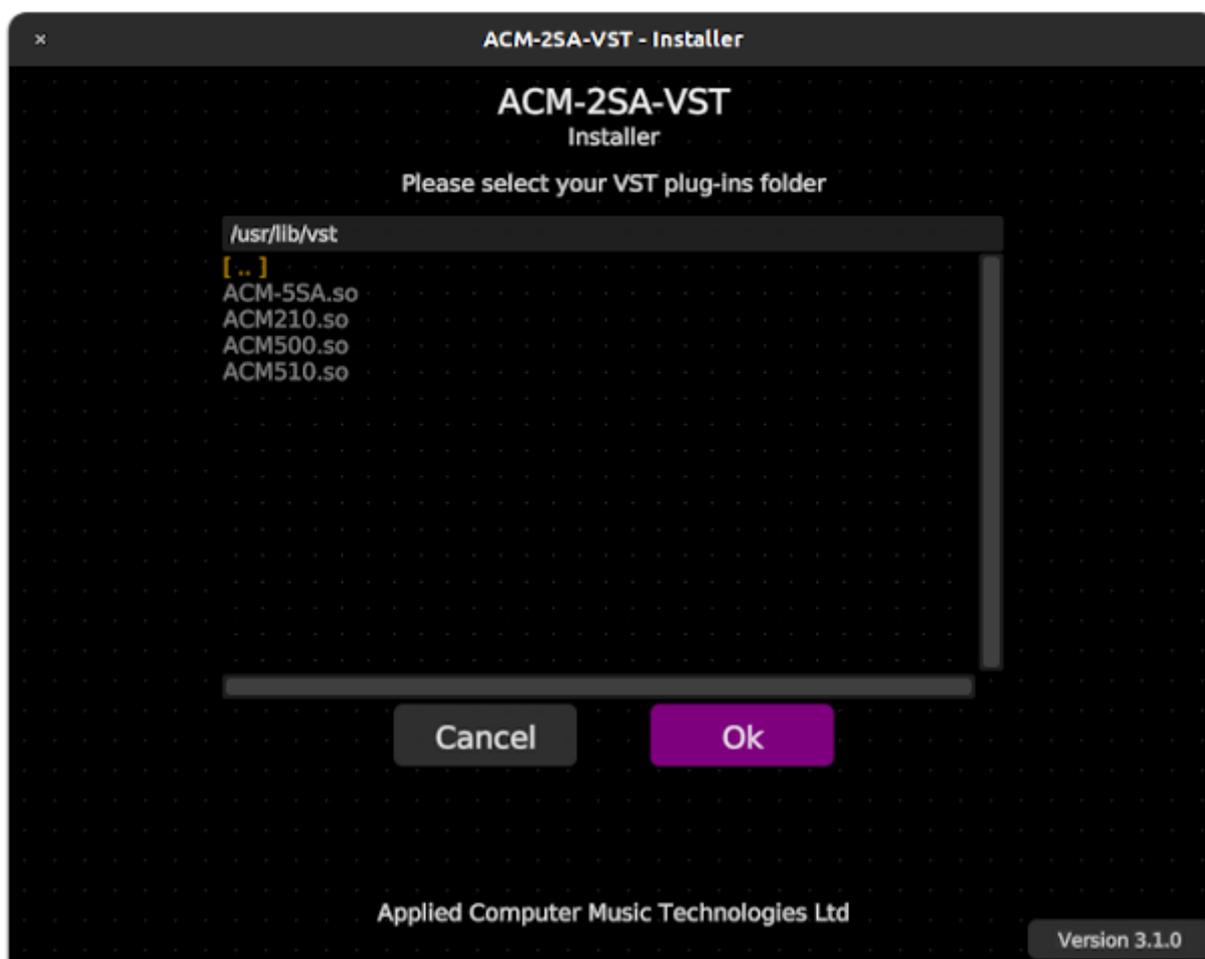
Run the installer executable by (double) clicking it in a file browser, or launching it from the command line. The installer will guide you through the installation process.



Selecting the Install Location

The installer will prompt for your plug-ins folder location. Normally this will be `/home/your-user-name/.vst` or `.vst3` It is recommended to have a single VST or VST3 plug-ins folder, but you can install the plug-in to as many different locations as you require (just run the installer again and select a new location).

Depending upon system configuration, you may also be prompted for your user or root password if you attempt to install to a system folder, or one to which you do not have write permissions. The installer uses a standard system authentication process (`pkexec`) and does not directly gain elevated permissions.



Troubleshooting:

The installer is designed to be self-contained and compatible with most Linux distributions, if you need to backup the installer, the single executable file should be all you need. However, due to the varied and customizable 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 to install the plug-ins manually.

1. Do not try to 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. The installer uses the `pkexec` authentication method if attempting to install to a system folder, or one to which the current user does not have write access. (the installer itself never gains root or elevated permissions on your system). If this is not a standard component of your Linux distribution, you will need to correctly install and configure it for your system, or select a different install location with appropriate user access permissions.
3. In some circumstances you may need to mark the installer as 'executable' in order for it to be launched. You can normally do this by right-clicking the installer and selecting:

Properties -> Permissions -> Allow executing file as program

Manually Installing the Plug-In:

If your system configuration is not compatible with the installer, you can install the plug-in 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 plug-in binary files are contained in the `plug-in_binaries.tar.gz` file within the x86 or x86-64 folders. Extract the archive, and you will find it contains VST and VST3 folders.

The VST and VST3 folders contain the plug-in in Linux VST and VST3 format.

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

2.3 Product Support:

If you are unsure how to install the plug-in, or encounter problems during the installation, please contact:

support@acmt.co.uk

Section 3 - Operation

3.1 - The Graphical User Interface



This is the ACM-2SA front panel. You can control it by clicking and dragging on the knobs or switches. Some controls may have indents – these manifest themselves as areas in the control 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. The way in which the rotary controls respond to mouse movement may also be affected by host application configuration, as described in the next section.

3.2 Control Modes

The control mode determines the way in which the rotary controls respond to mouse movement. This can normally be configured via the host application preferences. Please refer to your host application documentation for details.

1. Circular

This is the default mode unless changed by host application settings. Clicking on a control will move it immediately to the mouse pointer's angular position. To adjust the control, drag the mouse pointer in a circle or arc.

2. Relative Circular (Default)

Similar to circular mode, however moving the mouse will adjust the control relative to its current setting.

3. Linear

The control responds to vertical movement. Drag up to increase the value, turning the control clockwise, or down to decrease the value, turning the control anticlockwise.

In all modes, double clicking in the centre of a control will return it to its default position.

3.3 - 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 its centre and the value will appear in the status bar.

3.4 – Control Functions

Similar to some of the original vintage hardware EQs, the ACM-2SA 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 - 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 - 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 - 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 off, the EQ **and** the tube amplifier stage will be completely out of circuit and the audio will pass through unaffected. With the switch on, the EQ will operate normally. In this mode, the tube amplifier remains in circuit even when the EQ filters are bypassed ('EQ In' switch 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 - 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 on, the filters will be in the signal path and affecting the output. With the switch off, 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 off, 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.

Section 4 – System Toolbars

4.1 - Preset Selectors



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.

4.2 - Info Button



Clicking on the Info button will open a pop-up showing the current version, together with a product ID code if the plug-in has been activated with a valid key.

4.3 – Demo Indicator



The red lock icon indicates the plug-in has not been activated with a valid key. To unlock the plug-in and remove the demo limitations, click the button to open the demo / activation key pop-up and enter your key (see section 4.2). Once the key is accepted, the lock will change to an open symbol. **You will need to restart the host application to complete the activation process.**

4.4 – Phase / Polarity



The phase / polarity switch causes the signal at the output to be inverted. When switching between inverted and normal settings, or when bypassing the plug-in with the phase invert enabled, there may be a slight interruption to the audio.

4.5 – Output Trim



The level trim adjusts the output by up to +/- 6dB. Click on the control and drag upwards to increase the level or down to decrease. The mouse scroll-wheel can also be used to adjust the level in +/- 3dB steps. Double clicking on the control will return it to its default 0.0dB setting.

Section 5 - Presets

5.1 – Factory Presets

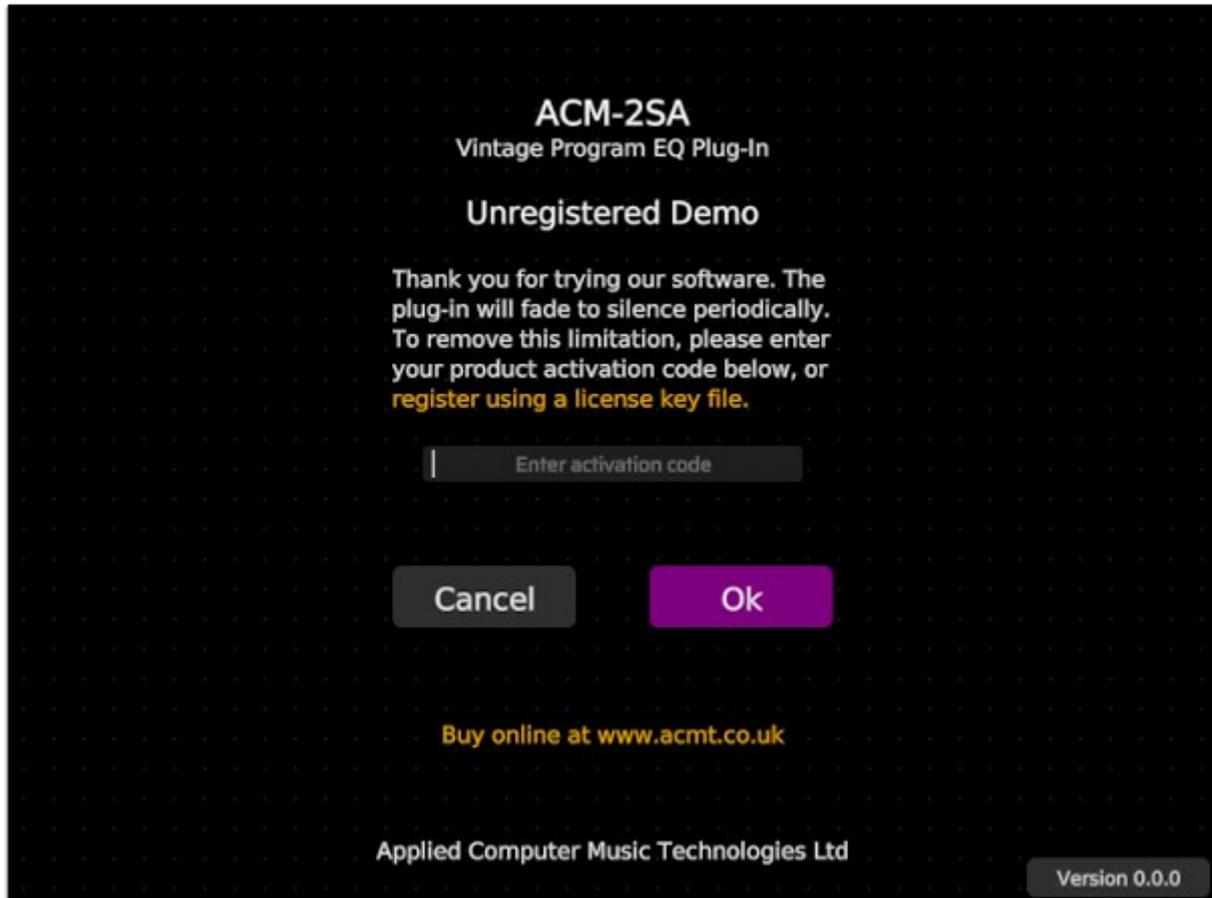
The ACM-2SA has twelve factory presets, designed to provide a guide to some of the more common combinations of control settings. For a more detailed insight into using the ACM-2SA, refer to sections 7,8 and 9.

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.

Section 6 – Demo Limitations

6.1 - Demo Screen

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 in demo mode and will run with some limitations. To remove these limitations you will need to obtain a valid activation key from the Applied Computer Music Technologies website at: <https://www.acmt.co.uk>



To activate the plug-in, enter your activation code into the text box (you can also paste it from the clipboard by right-clicking and selecting the 'Paste' context popup). You will need to restart your host application to complete the process. If you do not have a valid key, you can cancel the pop-up and activate it at another time by clicking the lock button in the plug-in's graphical user-interface.

Section 7 – About The Processing

7.1 ACM-2SA Functional Blocks

1. Passive Filters

Audio entering the ACM-2SA 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.

2. Transformer-Coupled Valve / Tube Amplifier Stage

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.

3. Bypass Switching

Just as in original Pultec style EQs, the 'EQ In' (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.

In this emulation, the 'power switch' is used to activate a clean bypass, completely removing the plug-in from the signal path.

Section 8 - Using the ACM-2SA

The ACM-2SA emulates some of the best qualities of vintage Pultec style 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:

8.1 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 types of units.

8.2 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-camped 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.

8.3 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 9 - Examples

9.1 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.

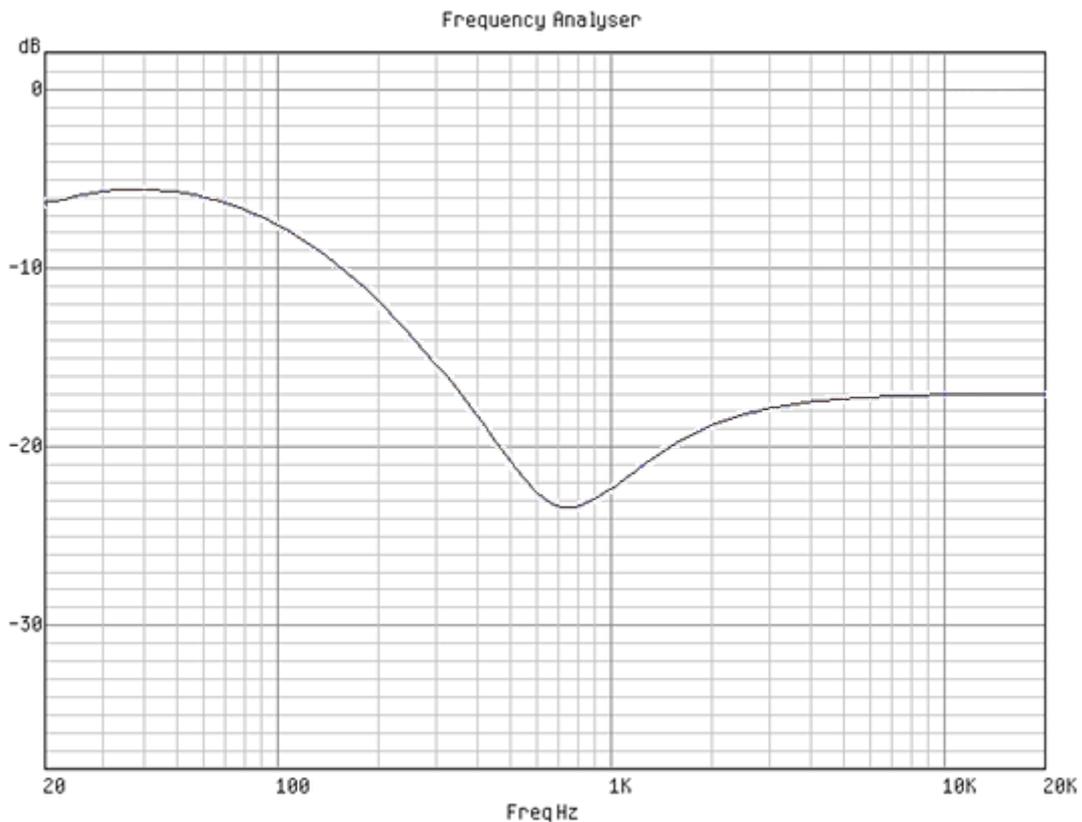
9.2 Boost and Attenuate at the Same Time



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 swept sine 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 -18dBFS
Sample Rate 48kHz

Control Settings

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

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Appendix

Appendix A - Technical Data

1. Technical Specifications

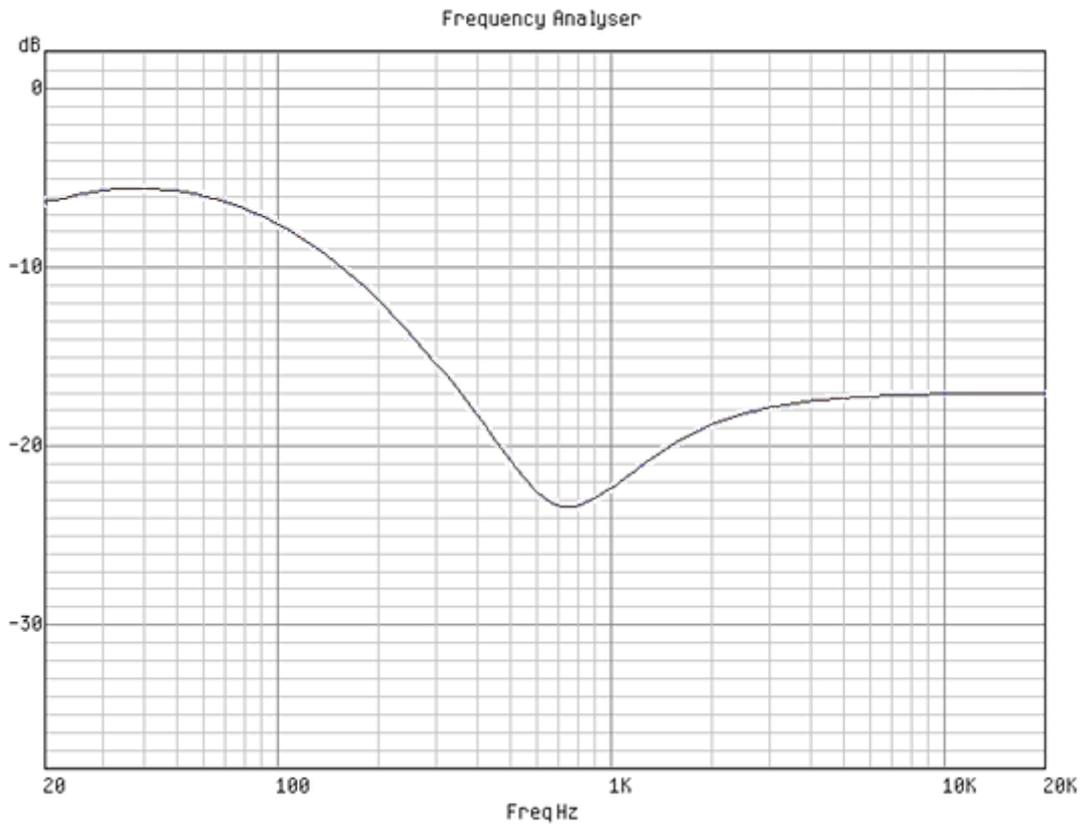
Frequency Response:	20Hz to $F_s/2$ (bypassed) - where F_s is the sample rate.
Internal Processing:	32bit floating point, 64Bit DSP coefficients and storage.
Reference Level:	0dBu = -18dBFS.
Dynamic Range:	Limited only by internal processing resolution (32bit floating point) and progressive limiting after -8dBFS (10dBu) due to transformer saturation emulation.
THD:	0.15% at +10dBu.
Max. LF Boost:	13.5dB Dependent on control interaction.
Max. LF Attenuate:	17.5dB Dependent on control interaction.
Max. Mid / High Boost:	18dB (sharp bandwidth). 10dB (broad bandwidth).
Max. HF Attenuate:	16dB.
Filter Slope	6dB / Octave.
Filter Types:	Low frequency shelf (boost / attenuate). De-cramped mid – high peak filter (boost). High frequency shelf (attenuate).
Frequency Ranges:	Low shelf: 20Hz, 30Hz, 60Hz and 100Hz. Mid: 3kHz, 4kHz, 5kHz, 8kHz, 10kHz, 12kHz, 16kHz. High shelf: 5kHz, 10kHz and 20kHz.
Filter Bandwidth (Mid):	1.5 - 2.5 Octaves. Dependent on control interaction.

NOTE: VST is a trademark of Steinberg Media Technologies GmbH

Appendix B - Measured Performance

1. Full Low Frequency 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

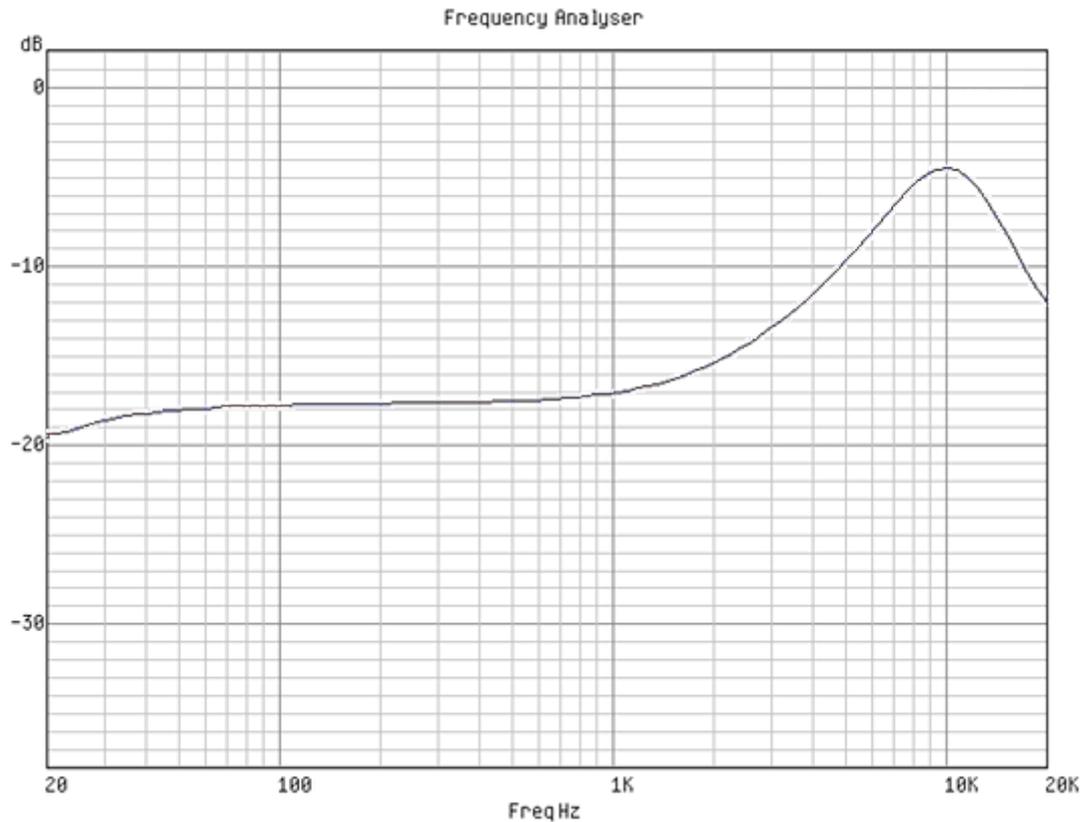
Input Signal 20Hz - 20kHz swept sine at -18dBFS
Sample Rate 48kHz

Control Settings

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

2. 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 -18dBFS
Sample Rate 48kHz

Control Settings

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

Appendix C - Spare Parts and Service

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

`https://www.acmt.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@acmt.co.uk`

Appendix D - Disclaimer

Disclaimer

All trademarks are the property of their respective owners and are used for information purposes only. References to other companies or their products or representation of those products does not imply any official endorsement of the software by those companies or any affiliation to those companies unless expressly stated otherwise.

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