

Audessence AM PRO-1

Installation & Operation manual




AM PRO-1 Manual [Version 2.20] 2013-07-29

For GUI / Controller software 3.0.4.13

Audessence Ltd, 64 Kimberley Road, Brighton, East Sussex, BN2 4EP, United Kingdom

Tel (UK) 0330 6600 108 :: (Int'l) +44 330 6600 108 :: Email: info@audessence.com

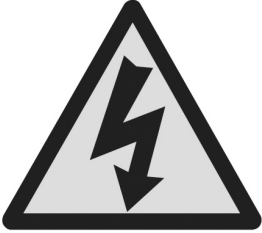

Contents

Safety Information	4
Risk of Electric Shock if cover removed	4
Warning Symbols	4
Other Safety Instructions.....	4
Conformity	6
Quick-start Guide	7
Installing the Audessence Controller Software.....	10
Connections	11
Analogue Audio Input and Output.....	11
Digital Audio Input and Output	11
Control.....	11
Power	11
	11
Earth / Ground.....	11
Input Setup.....	12
Lineup with tones.....	12
Lineup with programme	12
Input Metering	13
Input Source Options	13
Digital Rate.....	13
Phase Rotator	14
Highpass Filter	14
Input Gain Trims	14
Output Setup.....	15
Accessing Output Controls	15
Digital Output Rate.....	15
Tilt Ratio and Tilt Frequency	15
Procedure for setting up Tilt Corrector	16
Lowpass Filter	18
Output Ceiling Controls	18
Presets.....	19
Getting started with presets.....	19
Description of Factory Presets.....	21

Audio Processing Controls23
 Expert Mode.....23
 Easy Mode23
 Input and Output Setup controls.....23
 Expert Mode Audio Processing Controls.....24
 AGC.....24
 Compressor26
 Parametric EQ26
 Limiter.....27
 HF (Pre-emphasis) Limiter.....27
 Clipper.....28
Contact Us.....29

Safety Information

Risk of Electric Shock if cover removed

	<p style="text-align: center;">CAUTION</p> <p>To reduce the risk of electric shock, do not remove cover. No user serviceable parts inside. Refer servicing to qualified personnel.</p>	
---	---	---

Warning Symbols



The above symbol alerts the user to the presence of dangerous voltages inside the enclosure. Voltages may be sufficient to constitute risk of electric shock.



The above symbol alerts the user to important operating and maintenance instructions in manuals and other literature that may accompany the product. Please read, understand, and observe all safety information provided.

Other Safety Instructions

Safety Information: Retain all safety information for future use, including by others who may become responsible for the equipment.

Warnings: Take note of all warnings and adhere to them.

Water and moisture: This equipment does not have large openings in its enclosure, but neither is the equipment sealed against moisture. Do not use in the immediate vicinity of water or in an excessively humid environment. Take care that unit is not exposed to dripping or splashing.

Ventilation: The unit dissipates approximately 7 Watts of power only, which means it does not run significantly hotter than its surroundings. There is no specific requirement for air movement since the unit does not employ a cooling fan.

Heat: The ambient temperature where the unit is installed should not exceed 40 degrees Celsius.

Power Source: Use the equipment only with the type of power source described in the specifications and / or as marked on the equipment.



Grounding: Employ suitable grounding of all metal cases. A dedicated M4 size captive ground point is provided on all Audessence equipment for this purpose. If in doubt, consult a qualified electrician.

Servicing: Refer all servicing to qualified personnel only.

Conformity



This device complies with the requirements of the EEC council directives: 93/68/EEC (CE marking); 73/23/EEC (Safety - low voltage directive); 89/336/EEC (electromagnetic compatibility). Conformity is declared to the following standards as applicable: EN55022, EN55103-1, EN55103-2, EN61000-4-3, EN61000-4-4, EN60950-1.

USA Warning - This equipment generates, uses and can radiate radio frequency energy. If not installed and used in accordance with the instructions in this manual it may cause interference to radio communications. It has been tested and found to comply within the limits for a Class-A computing device (pursuant to Subpart J, Part 15 FCC rules), which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area could cause interference, in which case the user, at their own expense, will be required to take whatever measures may be required to correct the interference.

Canada Warning - This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the Radio Interference Regulations of the Canadian Department of Communications . Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux brouillage radioelectrique edicte par le ministere des Communications du Canada.



Use of Shielded cables: In order to meet EMC specifications as above, digital ports must be connected with the correct type of cable. This means foil-screened 110-Ohm digital cable (e.g. Canford DFT or Belden 1696A) for XLR (AES-3) ports and RG58 or similar coaxial cable for phono/RCA (S/PDIF) ports. Use of cheap lapped-screen cables may cause radiated emissions to increase and / or reduce immunity. Special cables are not required for analogue or power ports.

Quick-start Guide

Method of controlling the AM PRO-1

AM Pro-1 is set up and controlled from any Windows PC running the supplied Graphical User Interface (GUI) application ('AM Pro-1 Controller'). System Requirements: Windows PC running at least Windows 2000-SP4, any version of XP, Vista or 7. RS232 serial port and / or USB port required (RS232 works over longer distances).

The GUI has two modes: Easy Mode and Expert Mode. The currently selected mode is always displayed in the titlebar of the GUI. It is possible to start in Easy Mode and then transfer a setting to Expert Mode later if needed. However, if you start in Expert Mode then you CAN'T change to Easy Mode without starting all over again.

Most users should choose Easy Mode initially, and indeed this is the mode that the controller will start up in when the AM PRO-1 is 'fresh out of the box'. Easy Mode gives access to the factory presets and also has a highly simplified, time-saving set of controls for further tweaking of the audio processing for the most pleasing results. The GUI screens are straightforward and uncluttered.

Output controls that could cause the broadcast signal to be in violation if set incorrectly (e.g. Output Level and Lowpass Filter frequency) are not available in Easy Mode.

An Administrator can start the unit in Easy Mode, swap to Expert Mode temporarily so that the Output parameters can be set-up (but without 'UNLOCKING' full access to Expert Mode), and then return the unit to Easy mode such that a non-expert can tweak the audio processing at any convenient future time. By keeping the Administrator Password safe, the Administrator can rest assured that critical and legally sensitive parameters are safely locked.

Software Installation.

Software installs directly from CD - **without** connecting the AM Pro-1 unit first! Once the software is installed, then connect USB or COM port to AM PRO-1 unit afterwards. If you do not follow this advice, Windows will attempt to take over the installation, this will probably slow things down tremendously and in all probability will fail to install correctly. Installer programme should auto-run from CD, or if necessary run 'Setup.exe' manually.

Installer shell auto-detects which components are required for your system and installs everything automatically. You can change default location (directory), decide whether or not to install Start Menu and Desktop Shortcut items, etc., from the Installer shell.

Default connection at PC end is COM1. Go to 'Connections' menu in the GUI to change COM port, or re-scan for available ports and then select USB. USB will run as a virtual COM port and will normally be the highest COM port number in the list. All required COM and USB drivers are on the CD, they will install automatically without the need for any connection to the audio processor, and will then be loaded automatically when the connection to the processor is made.

Log-in and Security

Note that although you will be able to see menus and controls without logging-in, it will not be possible to change anything until logged-in. Log-in is found in Menus mode under \Security\Login. [NB: the right-hand of two big buttons at the top toggles the main screen between Menus Mode and Presets Mode]. When you first connect you will be taken directly to the Login screen.

Default login password in Easy Mode is AAAA. **Sessions TIME-OUT after 30 minutes of inactivity!** If controls aren't working you may need to log-in again.

There is an additional 'Administrator' password required to access the unit in Expert Mode. This is secured by scrambling the unit's Electronic Serial Number (ESN), so if the Administrator password ever gets lost do not worry, contact Audessence for assistance. The Admin password is found on each unit's Test Sheet.

Input - Analogue or Digital?

Decide whether you are going to be using Analogue inputs or AES (digital) input. Navigate to \Setup\Input menu and select the input you wish to use. At this time you can also select whether to sum a stereo input to mono, and set up other Input options such as highpass filtering and phase rotation. If unsure about the more advanced Input options, just select the input to Analogue or Digital as required and leave everything else as pre-set at the factory.

NB: If you select AES (Digital) input then at the same time you *MUST* select whether the Base Rate is 96kHz (supports professional input rates of 32, 48, 96kHz) or 88.2kHz (supports consumer input rates of 44.1 and 88.2 kHz).

Outputs setup

You may need to adjust the output level from the processor from its factory default of +8dBu in order to modulate the AM transmitter correctly. If you are running in Easy Mode then you do not have access to the Output Menu. However, you can change mode to Expert as a temporary measure to set up the Output. If you want to continue using Easy Mode after setting up the output controls, **DO NOT 'UNLOCK'** whilst in Expert Mode; and when done setting the Output options, return to Easy Mode before Saving and then exiting the GUI programme.

The \Setup\Output menu includes separate level controls for Analogue and Digital outputs. You can of course use both outputs simultaneously (e.g. using the second output for feeding a backup transmitter, or monitoring), and the Output Levels can be set independently. Also in the \Setup\Output menu is the Lowpass Filter selection which must **ONLY** be set according to the regulatory requirements of the nation in which the transmitter operates, and the setup for the Tilt Corrector. Tilt Corrector is an advanced feature which is covered in depth later in the manual. ***It is well worth checking this. If your transmitter has any 'tilt', it WILL be costing you loudness!***

When setting up the Output level for the first time, double check the **POLARITY** of transmitter modulation. Make sure that enhancing the positive peaks (clipper menu) actually enhances **positive** modulation rather than **negative** modulation!

Saving Changes - Important!

By default, all changes to controls that you make are temporary, ie loaded only into RAM - but not into the AM PRO-1s internal non-volatile memory, (which is used to load the settings at power-on). There is a 'Save' menu in the Menu tree, allowing manual saving of changes to non-volatile memory at any time.

Changes are also saved when you exit the GUI. If there any any unsaved changes, pressing 'Disconnect' will generate a dialog box which asks if you want to save or not.

Getting Started with a Factory Preset

Having set up Input and Output options, select a Factory Preset from one of the nine factory presets. See manual page 15. Then, if necessary (and it may well *NOT* be necessary!), use the Easy Mode controls to tweak the sound. All Easy-Mode controls display HELP-TEXT in a window pane towards the Right of the GUI screen when you hover the cursor (mouse pointer) over the control, so Easy Mode is very straightforward to drive.

Please don't forget audio quality

In audio processing, quite often less processing means better audio. It doesn't very often seem that way at first listen, but most audio professionals agree heartily on this point. For some interesting discussion on the rights and wrongs of heavy 'compression' of audio, see the following thoughtful discussions:

<http://www.digido.com/>

<http://www.turnmeup.org>

<http://www.digitalspy.co.uk/music/a59597/experts-music-is-getting-too-loud.html>

Enjoy

We wish you every success with your new digital audio processor, which can easily match or even exceed the sound quality and 'punch' of much more expensive alternatives.

Grounding



This equipment must be earthed by a permanent ground cable attached to the rear panel M4 fastener provided for that purpose and labelled 'GND'

Problems?

Please do not hesitate to email tech@audessence.com anytime for fast tech support.

Installing the Audessence Controller Software

See the separate manual “Audessence AM PRO-1 Controller Software Installation & Operation Manual” for additional information regarding installation and use of the AM PRO-1 Controller software.

Connections

All connections to the AM PRO-1 are conventional and standards-based:

Analogue Audio Input and Output

Electronically balanced, RFI-suppressed on 3-pin professional Neutrik XLR connectors. 10k (bridging) input, 50R (Low-Z) output.

- The input operates over a nominal range of -10dBu to +14dBu and will accept peaks of up to +22dBu without clipping
- The Output operates over the nominal range -14dBu to +21dBu for 100% modulation
- For balanced circuits, XLRs should be wired as follows: Pin 1 = screen, Pin 2 = 'Hot' audio, Pin 3 = 'Cold' audio
- Use of unbalanced connections is **not recommended**

Digital Audio Input and Output

AES-3 standard, RFI-suppressed on 3-pin professional Neutrik XLR connectors.

- Input accepts 32, 44.1, 48, 88.2 or 96kHz sampling rate, 16 to 24 bits
- Note the Input Rate has to be pre-selected for 44.1 or 88.2kHz inputs
- Output runs at 96kHz, 88.2kHz, 48kHz or 44.1kHz (synchronous with input, but Normal rate or Double rate can be selected at the Output)
- Use 110-Ohm AES-compatible shielded cable for best signal integrity and to maintain EMC compatibility

Control

USB on 'B' type female USB connector [Front panel] or RS-232 on 9-pin Female 'D' connector [Rear Panel]. Requires 'straight through' serial cable (not a 'null modem').

- Control ports operate 'in parallel'; NB use one-at-a-time only.
- For use with Audessence Controller GUI programme running on a Windows PC.

Power

Universal AC input on IEC connector accepts 100 to 240 Volts AC nominal.



Earth / Ground

A M4x10mm bolt is supplied with one spring washer and two M4 plain washers to mate with M4 female 'PEM' fastener on right-hand side of rear panel, next to IEC AC inlet. This is labeled 'GND'. **This equipment must be earthed for safe operation.**

Input Setup

Both analogue and digital Input level settings have been pre-set to optimised default values for typical programme material, as you would find it at the output of a radio mixing desk. In the analogue domain this means peaking up to PPM6 / +8dBu maximum, but with music generally peaking up to PPM5 / +4dBu, with higher levels reserved for the loudest parts only. In the digital domain this means the input peaking at around -16dBFS normally, and *occasional* true peaks can be up to about 6dB louder still.

Particularly with digital input, there is a chance of some programme segments (for example direct dubs from commercially mastered CDs) having a much higher peak level all the way up to 0dBFS. If required, AM PRO-1 will cope with these extra-loud inputs remarkably well.

[Technical note #1]: The additional headroom available on the analogue input for peaks caused by operator error is another 14dB; so the clip (= distortion) point of the input is +22dBu].

[Technical Note #2]: - because the AGC is r.m.s. responding, the procedure to calibrate the input gain of the unit with sine-waves does not correspond to older processors that respond to the peak value of the input signal. Line-up with tone requires that the level be 14dB lower than you might expect, because tone is that much 'denser' than typical programme material].

[Technical Note #3]: - because the Input and Output meters are true-peak responding, a **PPM meter** connected to the same signal will read the *same* value on tones but a small amount, (around 2dB) *less* on typical programme material.

Lineup with tones

A value of -30dBFS digital is required at the input to bring the AGC indication to 0dB with *sine-wave (NOT programme)* drive. This is normally equivalent to -10dBu analogue input (again, remember this is only with sine-waves).

Lineup with programme

The important thing to remember is that, with AGC engaged of course, the AGC meter in the PC control programme should sit at 0dB (plus or minus 4dB or so) when the incoming programme is peaking 'normally' i.e. around PPM 5 / +4dBu in the analogue domain, or alternatively, at around -16dBFS in the digital domain.

The top (red) LED of the input meters on the AM PRO-1 Front panel begins to light about 2dB lower than the input clipping point, i.e. at +20dBu using analogue inputs. If this red LED comes on, it is very likely the input signal is too loud, and / or AM PRO-1's input gain trim needs to be reduced.

Input Metering

The Left and Right 'Input' meters provided are calibrated in -dBFS, and are true-peak responding. If analogue input is in use, 'top of scale' or 0dBFS is equivalent to +20dBu. Normal programme peaks should register around -20 to -15dBFS on the AM PRO-1's input meters, regardless of whether digital or analogue input is being used.

Input Source Options

AM PRO-1 has seven input source options, most of which are self-explanatory. The first six modes are divided into Analogue or Digital (AES) source, then further divided into Left-only, Right-only or Sum-To-Mono, which is the default mode.

[Technical Note #4]: In Sum-to-Mono (L+R) mode, a 6dB attenuation is applied to the summed signal, so that headroom is preserved with no compromise, and in most cases there will be no significant net change of level on programme either.

Avoid selecting (L+R) mode if only one channel is driven, regardless of whether the source is analogue or digital.

The final mode is 'SquareWave Osc'. This is a test mode that applies a band-limited 100Hz square wave at the input instead of an audio input from the outside world.

Warning: *selecting 'SquareWave Osc' will cause a buzzing sound to be broadcast instead of the normal programme!*

This mode is used only for setting up the tilt corrector to cancel low-frequency 'tilt' that can spoil modulation in certain types of transmitter. See this manual page 11 for further information on Tilt Correction.

It can be well worth the time to check and improve tilt performance. Any tilt (low frequency roll-off) in the transmitter will rob the transmitted signal of loudness, because tilt causes overshoot. *To avoid wasting loudness, the low-frequency cutoff has to be down below 1Hz, a 'normal' low-frequency cutoff of, for example, 20Hz will cause a serious reduction of loudness!*

Digital Rate

If the Analogue inputs are to be used, leave this set to default 96/48 kHz sampling rate.

If Digital input is to be used, the Digital Rate selection must be set according to the sample rate of the source. Choosing 96/48 will allow the input to lock to commonly used Professional sampling rates: 96, 48 or even 32kHz. Choosing 88.2/44.1 will allow the input to lock to Consumer rates: 88.2 or 44.1 kHz.

Phase Rotator

Phase rotation is used to reduce asymmetry in audio signals where the amplitude of the positive peaks is statistically unequal to that of the negative peaks. Many voice signals fall into this category, whereas music (with certain exceptions such as solo trumpet) is often much more symmetrical. Deep male voices can be particularly difficult to process correctly because of their natural asymmetry.

For AM use, in most cases leave the Phase Rotator set at its default value of 2. To defeat, set to 0. Female voices can benefit from setting at 3 or 4, some male voices work better at 1, but we have found 2 to be best in the majority of cases.

Highpass Filter

This filter removes deeper bass components from the input signal. It can make a great improvement to audio quality if these lower frequencies can't be reproduced by the receiver, so if you are expecting most of your listeners to be using small portable radios it will be of particular significance. On the other hand, modern car radios can reproduce deep bass - so if the audience may be using either type of receiver, don't forget to evaluate the effect of this control in both situations.

- Minimum setting of 3Hz bypasses all bass-cut and just removes any DC offset from the input. Not recommended for use, included for 'proof' measurements only
- 25Hz setting acts as a 'sub-sonic' rumble filter only and will not significantly affect any programme, even urban hip-hop styles. Included for completeness
- 45Hz works well in cars with decent speakers, cutting only the lowest bass. For most AM applications, this is the lowest setting likely to be useful
- 70Hz is a good setting to use if most listeners will be using portable radios, and is the highest setting to use if quality sound in cars is desired
- 110Hz and higher settings produce a pronounced reduction in bass. These are included mainly for short-wave broadcasting and some digital broadcast systems such as DMB, where all receivers can be expected not to reproduce bass, and cutting through high noise levels has to take precedence over audio quality

Input Gain Trims

There should normally be no need to adjust the input gain. However, in recognition of the wide range of differing operational practices around the globe, 'Input Gain Trim' controls have been provided. N.B. analogue and digital inputs have individual gain trims. Be sure to adjust the correct control.

The procedure to adjust Analogue input gain follows: First login as per the procedure in Audessence Controller manual. Navigate to the '**Setup\Input**' Menu, and use the slider marked '**Analogue Input Gain Trim**'. The Input Gain Trim for analogue sources has a range of -8 to +14dB, with 0dB default.

The procedure if Digital input is in use is identical, except use the '**Digital Input Gain Trim**' control, and note that the available gain trim range for digital signals is -12dB to +6dB. **N.B: Positive settings of the Digital Input control are for use in exceptional circumstances only!**

Output Setup

Accessing Output Controls

Expert mode **has to be** selected for setting up the Output of the AM PRO-1. Generally, the Output only has to be set once, to meet local broadcasting regulations and match the AM transmitter being used. After adjusting the Output settings, if you then go directly back to Easy Mode (without 'Unlocking') and Save, you can remain in future using the familiar Easy Mode presets and controls.

It is designed like this so that parameters *of the transmission* which might be legally controlled, (like modulation percentage or spectral occupancy, which can cause real problems if they are set wrong), are protected from accidental change or change by someone not authorised - they are set up only by the Expert.

Expert Mode is accessed via an 'Admin password' (NB this is **not** the same as the 'User Password'). 'Admin Password' is 4 digits numeric. It is programmed at the factory and cannot be changed. You can find the Admin Password for your unit on the Test Sheet. If it gets lost or forgotten, contact Audessence with the serial number of your AM PRO-1, and we can look up the Admin Password for you. Email: tech@audessence.com for fast Audessence tech support.

Digital Output Rate

Digital Output Rate can be selected to be at full input rate (96kHz or 88.2kHz, depending on the input sample rate selection), or half input rate (48kHz or 44.1kHz). Use the higher rate if possible. This feature is provided for feeding older equipment that may not be able to accept faster sampling rates.

Tilt Ratio and Tilt Frequency

The controls can be set up to minimise low-frequency 'tilt' problems in AM transmitters. The low frequency -3dB point of the transmitter should be well below 3Hz in order to avoid problems, and ideally it should be 0.2Hz or less.

If the transmitter has excellent low frequency response and you are using the processor's Analogue output, leave Tilt Ratio set to a default value of 3 (and the setting of Tilt Frequency at 18). This corrects the analogue output of the processor itself to be perfectly flat. Alternatively, if you are using the AES digital output of the processor, leave the Tilt Ratio set to zero.

If the AM transmitter is suspected of poor low-frequency performance, it will be necessary to try adjusting the Tilt Ratio setting. **Setting up the Tilt Corrector can only be achieved by putting test signals through the transmitter that will result in an unpleasant buzzing noise being transmitted, so the transmitter will have to be taken off-air to perform the set-up.**

Please follow the itemised procedure below carefully...

Procedure for setting up Tilt Corrector

1./ Equipment required:

- Windows PC with AM Pro-1 Controller GUI programme
- USB or serial cable to connect PC to AM PRO-1
- Oscilloscope with at least 20MHz bandwidth
- Test lead to connect 'scope to transmitter RF monitor point

2./ Connect PC to AM PRO-1 and run Controller GUI programme.

3./ Navigate to 'Presets' (button at top left of GUI screen toggles between Presets and Controls). Press 'Save to File' button on far Right of screen to save the current setting as a file on the PC (you can name file at will). This will probably not be needed, but it saves time and /or could get you out of trouble if something goes wrong and you have to call Audessence tech support. Return GUI to 'Controls'.

4./ Take transmitter 'off-air' so it can be run into dummy load, or if this is not possible, perform the procedure at a time when audience is likely to be at a minimum. If necessary, let other station staff know that testing is to be carried out. Testing should take no more than 10 minutes as long as there are no unexpected problems.

5./ Change GUI to Expert Mode if not already in Expert mode. You will need the Administrator password for the GUI (this is a four-digit numerical password).

6./ Navigate to: \Setup \Input

7./ **IMPORTANT:** Write down the setting for the Phase Rotator

8./ **IMPORTANT:** Set 'Phase Rotator' to ZERO

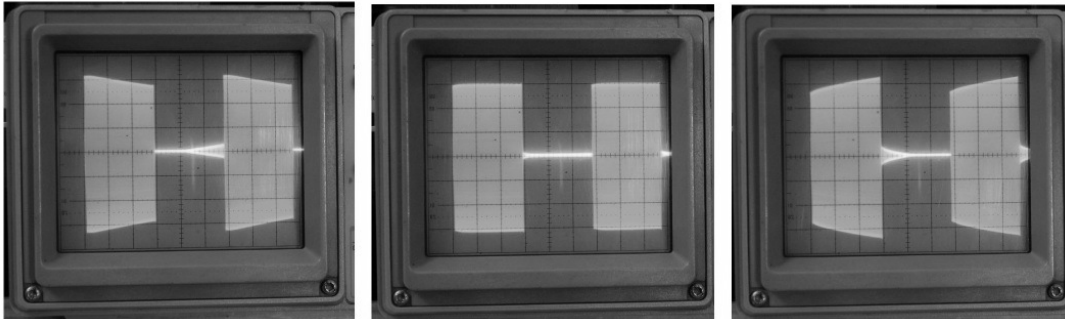
9./ Navigate to \Setup \Output menu and make sure the Tilt Frequency is set to 18

10./ Go back to \Setup \Input menu and under 'Input Source Options', select 'SquareWave Osc'

11./ Set up 'scope so that square-wave modulation envelope is visible, and triggered stably. A timebase setting of 1ms/div is normally good.

12./ Go back to \Setup \Output menu and adjust Tilt Ratio setting to get the envelope waveform of the AM signal as square as possible. See photos below. These pictures relate to a transmitter that had fairly poor LF response: a -3dB low frequency cut-off frequency around 9Hz. In this particular case, a Tilt Ratio setting of 6 corrected the tilt perfectly.

What you are trying to achieve is: to make the horizontal lines of the envelope exactly horizontal, and not tilted one way or the other.



Uncorrected LF cut in transmitter
(Tilt Ratio = 0)

Good Correction achieved
(Tilt Ratio = 6)

Overcorrected!
(Tilt Ratio = 13)

13./ If necessary, adjust Tilt Frequency also. (In most cases a Tilt Frequency of 18 will be OK).

14./ It may be necessary to repeat steps 12./ and 13./ iteratively to get the best cancellation of tilt.

15./ Write down the required values for Tilt Ratio and Tilt Frequency as 'backup' in case you ever accidentally overwrite the values stored in the AM PRO-1.

16./ Go to the Save menu in the main menu tree and press 'Save' to store all settings to non-volatile memory. Pressing 'Disconnect' (top Left of GUI screen) at some point from now on, will also cause all values set to be stored in the AM PRO-1 unit's non-volatile EEPROM memory. If you do this and want to continue setting up the processor, it will of course be necessary to reconnect and log back in.

17./ In future, be careful not to 'Load Setup Values' when loading presets, or Tilt Corrector values will be overwritten.

Lowpass Filter

The Lowpass Filter has to be set up to meet national and / or international regulatory requirements.

AM Pro-1 supports Lowpass filter cut-off frequencies of 3.5kHz, 4.0kHz, 4.5kHz, 5.0kHz, 5.5kHz, 6.0kHz, 10kHz NRSC, 15.5kHz, and 8kHz.

Output Ceiling Controls

The separate Analogue and Digital Output level ceilings of AM PRO-1 have been pre-set to default values that should be fine for 'normal' operation in a professional or semi-professional environment.

With default settings, the Analogue outputs peak at up to PPM6 (+8dBu), and the digital output peaks at up to -4dBFS. Both outputs can be set in 0.1dB steps.

Note that if asymmetrical peak modulation is used (e.g. 'positive peak 120%'), then the output level can exceed the stated ceiling (... because the modulation exceeds 100%). The ceiling calibration points have to refer to 100% modulation, or it would be very complicated to understand exactly what the 'peak ceiling' labels actually did refer to! **Note that the outputs have to have sufficient headroom for positive peaks of greater than 100% modulation. If positive peak expansion is used, the maximum output levels set should not exceed the levels in the following table:**

Positive Peak set to:	Maximum usable output level (Digital)	Maximum usable output level (Analogue)
100%	0.0dBFS	+21.0dBu
110%	-0.9dBFS	+20.1dBu
120%	-1.6dBFS	+19.4dBu
130%	-2.3dBFS	+18.7dBu
140%	-3.0dBFS	+18.0dBu
150%	-3.6dBFS	+17.4dBu

To adjust the Output level ceilings, login and navigate to 'Setup\Output' menu. '**Digital Output Ceiling**' and '**Analogue Output Ceiling**' have separate independent values, since you can use both outputs simultaneously.

'**Analogue Output Ceiling**' range is -14dBu to +21dBu. It is calibrated directly as the maximum peak signal that the unit can produce.

Digital Output: range is -20dBFS to 0dBFS. Default is -4dBFS. Likewise, see above for maximum safe setting of this control if positive peak expansion is used.

☑ Do check especially when first installing the processor that the connection to the transmitter gives the correct **polarity** of modulation. Make sure that enhancing the positive peaks (it's in the clipper menu) actually enhances positive modulation rather than negative modulation!

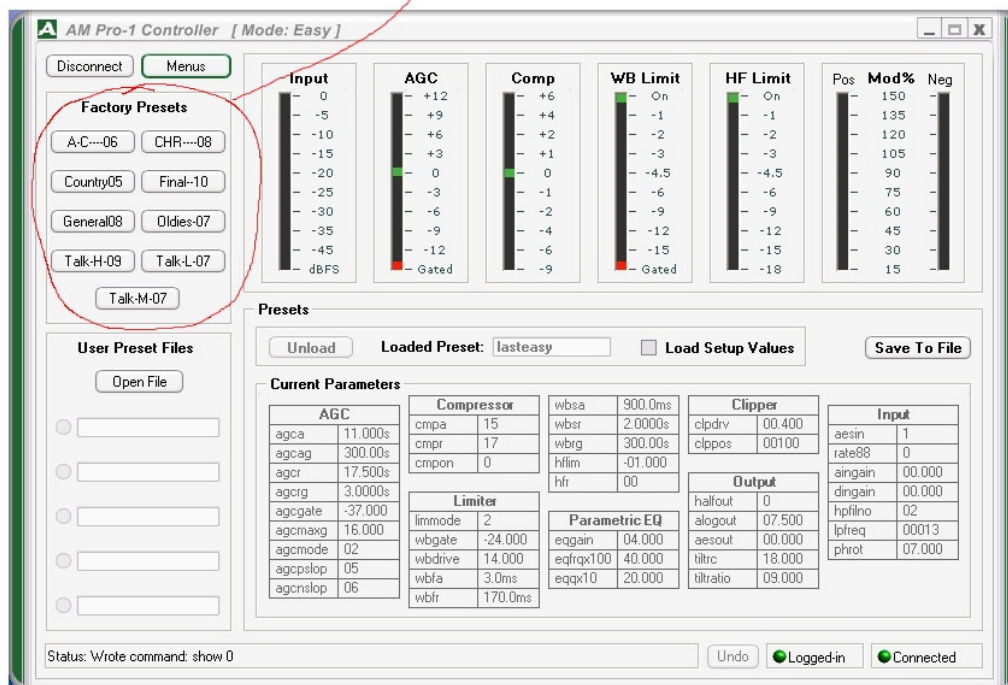
Presets

Getting started with presets

The best way to get started with setting the AM PRO-1 to produce the exact processing action you require is simply to load one of the nine built-in factory presets.

If you are in 'Menu' mode, press the 'Preset' button in the Controller (it's just to the right of the 'disconnect' button - **and N.B: this button toggles between 'Menu' mode and 'Preset' mode**). This will bring up a list of available presets for the unit. Even if you have never worked on Presets before and thus have no User Preset Files on your PC, you will see the nine Factory Presets that are loaded into each AM PRO-1 unit during manufacture:

Factory preset selection:



These can be loaded for immediate use, just by pressing the relevant button. A description of the purpose and action of each factory preset follows...

- **Note on Impermanence**

When you press the button for a factory preset, the preset is loaded into volatile memory only. If you make a mistake and overwrite a previous setup that turned out to be preferable to the factory preset you just loaded, don't despair! To get back to the values that were in use immediately prior to entering the Presets screen, just click the button marked 'Unload'.

Any changes you make are automatically saved to non-volatile memory on exiting the GUI (a dialog box will prompt you to save if there are any unsaved changes).

Alternatively, if your adjustment session is likely to take more than a few minutes and you want to save changes as you go along, press 'Save' in the 'Save' menu periodically.

You can also save all settings to a file on your PC for later use or 'cloning'. The 'Save to File' button is found in the Presets' area (use 'Presets' button next to the 'Connect' button to access the presets area. This button toggles between Presets and Menus).

- **Note on Setup Parameters and Presets**

Please note that Presets normally include only the parameters that affect the audio processing directly...

There are some additional 'Setup' parameters in the Input and Output menus that are saved in the AM PRO-1 hardware unit but are not normally loaded from a preset, because they are likely to be specific to the individual unit rather than to a preset.

The engineering - related parameters include:

- Input Source
- Input Gain Trims
- Digital input rate selection
- Digital output rate selection
- Low-pass filter selection
- Tilt Corrector settings
- Output Ceilings

In general these values do **not** form part of the 'factory presets' stored in the AM PRO-1 unit, ***except that some of these ARE loaded automatically by the Expert mode preset called 'Proof'***. (Please see note at the bottom of **page 22** regarding how to exit the 'proof' preset correctly).

These values ***are*** saved when a setup is 'Saved As' a file on the PC.

When Uploading a file ***from*** PC to the AM PRO-1, there is a checkbox to select whether or not to load Setup Parameters into the AM PRO-1.

Description of Factory Presets

Note (1): Presetname**: the final two characters of every preset name are numerical and indicate the version number of that preset. Obviously, these numbers are subject to change.

- **Preset 1: Talk-L-** (Talk Light)**

This preset was designed for medium wave broadcasting of mainly speech programmes, where there is no need for maximum loudness or exaggerated presence. This preset gives a very natural and pleasing sound for all voice programmes. Very little presence enhancement is used, so voices have a natural, rounded quality.

- **Preset 2: Talk-M-****

This preset was designed for medium wave broadcasting of mainly speech programmes, and strikes a 50-50 balance between loudness a natural sound. Somewhat more aggressive peak processing is used to boost loudness to moderate levels. Presence frequencies around 4kHz are enhanced to aid intelligibility, but not so much as to sound unnatural or harsh.

- **Preset 3: Talk-H-****

This preset was designed for medium wave broadcasting of mainly speech programmes, where a loud, clear and intelligible signal is needed. Aggressive peak processing is used to boost loudness to high levels. Presence frequencies centred just below 4kHz are enhanced considerably to aid intelligibility. This preset certainly does not give the most aggressive result that the processor is capable of, and is still very listenable. 'Talk' presets tend to use shorter attack times in the limiting section to ensure a smooth, listenable quality on voices.

- **Preset 4: Country****

This preset is optimised for 'Country' music. In this genre, female vocals and fiddle (violin) abound, and these can easily sound harsh or strident. The preset uses a small cut around 2kHz, relatively fast attack times, and very little clipping, all to avoid harshness. It is more balanced towards audio quality than loudness. AGC time constants are optimised for programmes that are mainly music based.

- **Preset 5: A-C----****

This is for all styles of Adult Contemporary music. It is designed to sound bright and clean, with moderate loudness and punchy drum sounds.

- **Preset 6: General****

This is the factory default preset that will be loaded when your AM PRO-1 is first switched on. It is designed to process any type of programme well for those who need to get on the air in a hurry and without reading the manual! AGC speed is a compromise between Speech and Music settings, peak processing and enhancement is moderate. So whilst it is definitely not the absolute loudest, the brightest, or even the most pleasing on voice, it will do a decent job of processing *any* type of programme material.

- **Preset 7: Oldies--****

Designed for music stations with an 'Oldies' music policy (surprise, surprise!). Not as bright as A-C, but fuller in tone and a bit louder.

- **Preset 8: CHR----****

Contemporary Hit Radio goes for a heavily processed effect with lots of peak limiting for loudness and density. Bass will sound enhanced due to clipping. Some brightness enhancement is also used. This is the loudest of the factory presets. Audio quality still sounds good on pop music and speech. Clipping is only moderate. To go any louder than this, it will be necessary to hit the clipper harder, with the resulting trade-off of audio quality.

- **Preset 9a: Final--**** [N.B: AVAILABLE IN EASY MODE ONLY]

This is for post-processing at transmitter sites, where AGC and multi-band processing has already been performed earlier in the signal path.

For example, the 'main' processor could be located in the studio or switching centre of the radio station. The output of this processor could feed satellite distribution to any number of AM (and FM as well if desired) transmission sites. At each AM site, an AM PRO-1 running this preset takes care of: Limited amount of AGC to take out variations of gain in the signal path, Lowpass filtering to meet spectral occupancy regulations, Presence / Brightness enhancement to overcome deficiencies of AM receivers, and final limiting and clipping for optimum loudness. By locating these functions in a low-cost processor at each AM transmission site, AM performance is optimum, costs are low, and the satellite signal is suitable for direct listening by the public and / or feeding FM transmitters as well.

- **Preset 9b: Proof--**** [N.B: AVAILABLE IN EXPERT MODE ONLY]

WARNING: THIS IS A SPECIAL PRESET PURELY FOR MEASURING AND PROVING AM PRO-1's PERFORMANCE. SELECTING THIS PRESET DEFEATS LOWPASS FILTERING AND OVERWRITES SETTINGS FOR PHASE ROTATOR AND TILT CORRECTOR. N.B: AFTER USING PROOF, USE THE 'UNLOAD' BUTTON IN THE PRESETS WINDOW TO RESTORE CORRECT OPERATIONAL SETTINGS, OR IT WILL BE NECESSARY TO RE-SET LOWPASS FREQUENCY, PHASE ROTATOR AND TILT CORRECTOR.**

Audio Processing Controls

Expert Mode

The Audio Processing Controls found in Expert Mode and described on the following pages are designed for the use of audio processing experts.

If you are not experienced in adjusting audio processors, start by using factory presets.

If you can't find a preset that gives the desired result, try '**Easy Mode**' (See below) or contact Audessence by email - in the first instance to: tech@audessence.com

Easy Mode

We have also provided a vastly simplified set of just seven controls that are easy for any non-expert to use: we call this '**Easy-Mode**'.

'**Easy-Mode**' will allow you to easily create a customised setting, but without having to go into all the technicalities of audio processing.

All '**Easy-Mode**' controls display help text when you hover the cursor over them. Thus Easy-Mode is easy to learn just by hovering the cursor over all areas of each screen and reading the associated help texts (help text appears in the right hand pane of each window).

Please note that Easy Mode settings can be carried into Expert mode but Expert Mode settings do not transfer into Easy Mode. If you are not sure which mode to use, it may be best to start in Easy Mode. If you later want to change to Expert Mode, save your results to File on the PC before changing mode.

There is more information about Modes in the '*Controller Manual AM*' PDF document.

Input and Output Setup controls

Full explanations and details of how to set up these controls are found earlier in this manual, in the sections titled '**Input Setup**' and '**Output Setup**'. These can be found on pages 8 to 14.

Expert Mode Audio Processing Controls

AGC

[AGC Basic]

- **Attack**
Controls how fast the AGC responds when the input is getting louder.
- **Release**
Controls how fast the AGC responds when the input is getting quieter.
- **Gtd (Gated) Attack and Gtd Release**

These controls are all about what happens during pauses in the programme. N.B., you can use the **AGC GATE** control, found in **AGC Advanced** menu, to set the level below which a pause is identified.

If the programme before the pause was loud, then the AGC will be in negative gain immediately prior to the pause. In this case, during the pause the AGC gain will head up towards 0dB at a rate determined by '**AGC Gated Release**'. A moderate AGC Gated release (maybe 5 seconds) is good, because if the AGC was stuck in negative gain it would be dangerous to have it recover too slowly in case the next passage starts quietly. Using a moderate AGC Gated release time gets you smoothly back to 0dB ready for whatever may happen next after a pause in the programme.

If the programme before the pause was quiet, then the AGC will be in positive gain immediately prior to the pause. In this case, during the pause the AGC will head back towards 0dB at a rate determined by '**AGC Gated Attack**'. A very slow AGC Gated Attack (maybe 300 seconds) is good, because if the programme was very quiet as it went under the gate, it is also likely to still be quiet as it comes out of the gate again. In these circumstances, you want the Gain Reduction to effectively freeze during the pause, this way very quiet song intros or a very weak speech segment do not go dipping and surging as they vary around the gate threshold, they just stay boosted, which is better. The maximum AGC boost in these circumstances will be constrained by AGC Max Gain (see later).

If programme does get very loud with positive AGC after a pause then the various attack times deal with that situation remarkably well, the peak limiter keeping things under control while the AGC reacts. If Advanced AGC is selected, even huge surges of say 30dB are coped with well.

[AGC Advanced]

- **Mode** [Off / Normal / Adv (Advanced) Low / Adv Medium / Adv High]

Off means no AGC action at all. The AGC gain will be permanently frozen at 0dB.

Normal means the AGC response will use fixed time-constants ('AGC Attack' and 'AGC Release') only.

Adv-Low means the AGC response will speed up if its target gain is outside a total range of 16dB around the current gain, and is above the AGC gate threshold.

Adv-Med means the AGC response will speed up if its target gain is outside a total range of 14dB around the current gain, and is above the AGC gate threshold.

Adv-High means the AGC response will speed up if its target gain is outside a total range of 12dB around the current gain, and is above the AGC gate threshold.

- **Gate**

The AGC gate determines the level of incoming programme below which 'Gated' behaviour (- a controlled return of the AGC gain to its 0dB 'resting' position), occurs.

- **Max Gain**

This control limits the maximum amount of boost the AGC can apply to quiet sounds that are nevertheless above the AGC gate threshold. Essential when advanced AGC is engaged, to prevent unnatural boost profile of sounds that are trailing away towards silence.

- **Pos Slope:**

This controls how much correction is applied to inputs that are too quiet (i.e. that will result in positive AGC gain). Expressed as a ratio, or slope. Max setting of 'Inf' (infinity) applies total correction - e.g. a signal that is 10dB too low will be boosted eventually by 10dB (eventually because of the effects of time constants). A setting of 2:1 applies 50% correction, i.e. 5dB correction for a 10dB gain error).

- **Neg Slope**

This controls how much correction is applied to inputs that are too loud (i.e. that will result in negative AGC gain). Expressed as a ratio, or slope. Max setting of 'Inf' (infinity) applies total correction - e.g. a signal that is 10dB too loud will be cut by 10dB. A setting of 2:1 applies 50% correction (5dB correction for a 10dB gain error).

Compressor

The compressor is designed to boost very low level signals moderately, and to ameliorate very high levels. It is useful for making the sound 'denser' and more audibly compressed, if that is desired.

The compressor also includes a 1.33:1 expander function below -31dB_{BrNOL} [reference: normal operating level] so that for very low levels below -43dB_{BrNOL} the compressor has unity gain even when engaged.

The compressor has a fixed maximum boost of just 4dB between -31dB_{BrNOL} and -22dB_{BrNOL}. It has a slope of 1.5:1 above threshold so that at -10dB_{BrNOL} it has unity gain and at +20dB_{BrNOL} it has -10dB gain.

On/Off: A detailed description of the function of this control is beyond the scope of this manual. Suffice to say for now that it enables or disables compressor action.

Attack and Release: Compressor uses a simple single time-constant scheme. Time-constants are specified by preset numbers. Smaller numbers mean shorter times, on a logarithmic scale.

#4 = 0.33 milliseconds	#13 = 170 milliseconds
#5 = 0.65 milliseconds	#14 = 340 milliseconds
#6 = 1.3 milliseconds	#15 = 680 milliseconds
#7 = 2.7 milliseconds	#16 = 1.4secs
#8 = 5.3 milliseconds	#17 = 2.8 secs
#9 = 11 milliseconds	#18 = 5.6 secs
#10 = 21 milliseconds	#19 = 11 secs
#11 = 43 milliseconds	#20 = 22 secs
#12 = 85 milliseconds	#21 = 44 secs

Parametric EQ

This is the same form of powerful equaliser used by recording studios and mastering engineers to make recordings sound great.

Gain: Gain is adjustable between -8dB (i.e. 8dB cut) and +8dB (8dB boost) at the selected frequency. It is important to remember that cut is much less audible than boost. Cutting frequencies can be useful, but handle with care, as the results may not be as immediately apparent as they are when boosting. The 'normal' range for this control is from zero to +/- 5dB. *Use settings of greater than 5dB only with caution!*

Frequency: Selects the frequency to boost or cut in the range 1kHz to 9kHz. Frequencies between 1.5 and 4kHz are great for boosting voice 'presence'. Settings from 3kHz to 6kHz help music retain brightness.

'Q': Determines the bandwidth of frequencies that will be affected; whether 'Wide' (low numbers) or 'Narrow' (high numbers). Enhancement will be more audible at wider settings. However, if this setting is made too wide, undesired frequencies may be enhanced, so a mid-range setting around 1.0 to 1.2 is often best.

Limiter

[Limiter Basic]

- **WB (Wideband) Drive**

This is a very important control and is quite easy to grasp. Increasing the drive from 0dB makes the output sound louder, but without the peak output of the processor exceeding the Output Ceiling set in the Analogue I/O menu. If you want the target output level of the processor to be louder or quieter, it can be achieved in most cases by setting this control. Higher numbers (more drive) will make the sound louder.

In technical terms, the wideband drive is a fixed gain after the AGC stage and before the wideband limiter stage. Drive can only be set if the wideband limiter is engaged, or in other words if the wideband limiter is off, then the wideband drive *always* defaults to 0dB no matter what the slider is set to.

- **WB (Wideband) Gate**

This is an advanced feature that slows down the release of the wideband limiter during pauses in the programme, useful for reducing over-processing of voice signals.

Normal setting is -20 to -30dB.

- **Limiter Advanced**

These are advanced time-constant settings that take great experience to set correctly. We recommend **NOT** to adjust these settings unless you have considerable experience. Normal settings are:

Peak Attack: 1ms (smoothness) to 5ms (punch)

Peak Release: 50ms (loud) to 180ms (quality)

Platform Attack: Normally around 400ms-1s

Platform Release: Normally around 1s (louder) to 4s (quality)

But NB these last two are interactive

HF (Pre-emphasis) Limiter

- **HF Release Slow - Medium - Fast**

This setting affects a trade-off between brightness and distortion in the HF limiter. Medium will be right for most applications. Slow will make the sound less bright but possibly cleaner as well. Fast works the other way for a 'brighter' sound.

- **HF Threshold**

This is an advanced feature. Don't adjust this control unless you are an expert. The 'normal' setting (matching the Wideband limiter threshold) is -1dB, but a lower setting like -2dB often leads to a more pleasing, 'cleaner' sound.

Clipper

- **Clipper Drive**

This setting affects a trade-off between loudness and audio quality. Adjust it with care... AM PRO-1's clipper is an advanced brute-force loudness tool! Remember that clipping distortion can be more noticeable on voices, particularly solo singers and announcers when there is no background music; so please be sure to evaluate the setting under these conditions as well as on music (if applicable).

- **Positive Peaks**

This allows positive-going peaks in the output signal to be larger than negative-going peaks. This allows more power to be radiated and will make the sound slightly louder.

Use of such 'asymmetrical modulation' is legal in some countries but not in most others; **please check the legal situation** in your country before deploying this feature!

Using enhanced positive peaks will place extra burdens on the AM transmitter's power supply, voltage insulation and power dissipation. **Please be sure that your transmitter can handle the asymmetry!** Check with the manufacturer if not sure. Older transmitters employing transformers for high-level amplitude modulation can't take asymmetry.

When setting this control above 100%, ensure the audio connection to the transmitter is correct polarity, causing **positive** peaks to be enhanced, not the **negative** peaks!

Contact Us

Please contact Steve Webster if you have any questions, comments or suggestions regarding the Audessence Controller PC programme.

Email: steve@audessence.com and please cc your email to tech@audessence.com

Please contact Martin Spencer if you have any questions, comments or suggestions regarding audio processing, setup of Audessence audio processors and operational considerations.

Email: tech@audessence.com

Please contact Graham Sloggett if you have any questions, comments or suggestions for the Sales department.

Email: sales@audessence.com

[ends]./