

analogue
tube

AT-1 Mono Limiter

User Manual

Serial No _____

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Thank you for purchasing the AT-1. This compressor and its development represent state of the art passive design using tried and tested tube technology that includes the development of the 6386LPG dual triode. The re-introduction of these special tubes represents several years of research and in many ways is at the heart of the operation of these compressors. The operation and performance of the AT-1 is the same as similar Fairchild 660 units of the day, but now has a new creative element in the production of music with some additional features allowing the engineer to develop individual tracks and titles.

Through careful adjustment the unique features of this compressor allow all types of instruments and sound - typically in complete mixes or as individual tracks - to sit 'up front' sounding 'fatter' and 'bigger' in the mix. For example, a vocal track that sits back in the mix can carefully be brought forward adding depth, dimension and clarity, gluing the image together for all types of programme, making this natural sounding compressor an indispensable tool.

The AT-1 uses a double triode gain reduction amplifier and a push-pull amplifying stage that produces a high voltage side-chain for gain reduction control. The result is that the gain-controlled amplifier never produces any audible or observable thumps or pops. Contrary to most limiting amplifiers of the day, this unit has extremely low distortion and noise under all conditions, both as a straight-through amplifier and under maximum limiting conditions.

The attack time of this compressor is made extremely fast (micro seconds) in order to catch short transients the release time is adjustable from 0.3 seconds to 25 seconds in six steps. Two of these have release times which are automatic functions of the program material, providing fast recovery for short-duration peaks and an automatic reduction with a very long recovery time of overall gain should the program level remain high.

Owing to the wide choice of attack and release times, as well as the automatic recovery positions, this unit can be used to limit program material severely without producing the audible thumps or pumping so often associated with limited program material.

All TC settings are the same as the original Fairchild 660/670 units

Like the original Fairchild 660, the AT-1 incorporates a single independent feedback limiter which can compress or limit signals. It is designed to be placed in any normal line level circuit across the mix bus (if 2 are used) or inserted in a channel.

The AT-1 has a few distinguishing features that set it apart from the AT-101 stereo units. Particularly the attenuator control as this is an original tapered step attenuator remade as it was back in the 50's. This control sweeps from ∞ to 0 db. Your limiter is a versatile tool and is capable of handling and manipulating a large variation of signal program and provides more functionality than the basic original units by having a separate balanced *key* input splitting up the GR stage and AC threshold stage at the push of a button.

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Threshold Adjustments

It is possible (with careful adjustment of the AC and DC threshold controls) that the AT-1 can be used in any compression or limiting situation. The DC threshold control is found at the rear of the unit marked *Thresh*

1. Set the AC threshold control to zero and adjust the input gain control for unity. (between 16 and 12)
2. Turn both AC and DC threshold controls to their full clockwise positions.
3. Apply a 1k signal to the input 3db higher than the desired output level, and adjust the DC threshold control to the desired output.
4. Increase the input signal to 10db higher than the desired output level, and adjust the AC threshold control to the desired output level.

Normal operation

For normal operation adjust the attenuator controls for unity advance the stepped AC threshold control CW until the desired output level is achieved. As can be heard the compression / limiting action is removed completely when the AC threshold control is rotated fully CCW. Note that milder use of these controls will allow a greater dynamic range for compression.

The time constant switch positions give a wide choice of attack and release times. Position 3 may be the first point from which to start, this is a general purpose position;

Attack times (micro seconds)	Position 3	400 micro seconds
Release time (seconds)	Position 3:	2 seconds

With certain types of music or speech a faster time constant is needed and positions 1 or 2 could be better. For classical music a much slower position 4 is needed.

Getting your sound!

Experimentation is the key here as the unit's performance and operation are dependent on several factors; Attenuator position, AC/DC Threshold controls and the Attack/Release

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switches. Generally a good starting point is to set the Attenuator controls to 16 and the AC Threshold controls to 5 (midway) The DC threshold controls (At the back of the unit) are generally set for the 1 o'clock position) this has been set in this way for general equipment performance. But you may need to readjust for increased or decreased AC threshold sensitivity.

Remembering that sometimes this may be on an un-balanced insert where signal levels may be lower than say across a mix bus. Run the program and carefully adjust the Attenuator's CW gradually you'll begin to see the meters move indicating gain reduction. Note also that the position of the Attack/Rel switches may also gently change the tone and character of your signal. This may be most noticeable on a position with a short release time like position 1 for example. Gradually as the Attenuator is turned CW progressively more gain reduction is observed on the meters. You will find after some experimentation that this may also increase the flexibility of your controls. Consider also parallel compression.

The AT-1 has several new features

- Stepped AC Threshold
- External *Key* input
- Stereo link
- Bypass

The AT-1 provides a repeatable *stepped* 21 position AC threshold control particularly useful when linking 2 units together and recalling tracks. This control has a 1% accuracy per step.

The External *Key* input (when activated) splits the GR and AC Threshold circuits up and provide access to the compressor side chain. The AT-1 provides access to a 2nd balanced input which is particularly useful for De-essing, Ducking and Recording Stems. In this mode the AT-1 can also be used as a straight line amp!

The AT-1 has a switchable stereo link where you can link 2 (or more) units together for linked stereo operation. The link operation is the same as the stereo AT-101 where either left or right channel has control.

Side chaining opens all sorts of possibilities

For example in De-essing one can heavily EQ the control signal i/p so when only selected frequencies appear at the ext key i/p, does the compressor kick in. Such a compressor can be used as a de-esser, reducing the level of annoying vocal sibilance in the range of 6-9 kHz. This arrangement involves for example an AT-1 compressor and an external equalizer by feeding a 6-9 kHz-boosted copy of the original signal into the side-chain i/p or external i/p input of the compressor.

Finally the AT-1 has a full bypass function where the unit can be switched fully out of the signal chain during operation.

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Balance and Zero adjustments

The unit normally maintains the balance and zero adjustments over a wide range temperature, power line voltage and tube aging, small unbalances of <1/4db do not normally produce any problems.

1. Allow the unit to warm up for at least 1/2hr
2. Adjust the Balance control until the same meter reading are achieved in each position
3. With the meters switched to Zero adjust the Zero control to read 0vu
4. If this adjustment does not produce a reasonable balance replace one or more of the 6386LPG tubes or the original 5 star GE version tubes if you are using them.

Your new AT-1 limiter comes fitted with XLR connectors at the rear of the unit for In and OUT operation including the Ext Key i/p stage. EUK models are pin 2 hot whilst US models are pin 3 hot. The AT-1 limiter is fully balanced in and out, as well as working normally in mix insert applications.

In some cases these limiters are supplied with their own shipping Peli 0370 flight case. Each case is filled with soft foam protecting the unit to during transit. These flight cases should be retained for future use if the unit is to be transported or relocated. Please keep the flight cases somewhere safe. Each unit it shipped with a full set of instructions that includes signal graph specification and information relevant to each unit. These documents should be kept in a safe place for future reference.

Adjustments

There are no internal adjustments.

1/ Meter calibration: The *Zero* control adjustment adjusts for the meter position. When you make a *Zero* adjustment the meter needle moves. Calibration is made by adjusting the meter needle for 0vu on the meter scale after the unit has warmed up for 20 mins and measuring the voltage: pin 3 of V9 (6BL7) should read 200vdc

The *Zero* control is located on the front panel marked *Zero* This adjustment has been set. After the unit has been switched on the meter needle will take at least 15 mins to stabilise and reach 0vu

2/ The adjustment for the gain reduction stage heaters is fixed to 6.3vac

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SPECIFICATIONS

Input impedance	600ohms
Output impedance	600ohms
Source impedance	<4ohms
Input level	>28db before clipping
Ext Key i/p	line in Balanced
Output level	Output 27dbm before clipping
Gain	18 db (no limiting)
Frequency response	20hz to 20khz <1 db (Straight line amp)
Thd+N vs Freq	<70db @ 10khz
Limiting noises	Below audibility
Attack times (micro seconds)	0.2 milliseconds in positions 1, 2, and 6. 0.4 milliseconds in positions 3 and 5 0.8 milliseconds in position 4
Release times (from 10 db of limiting)	Position 1: 0.3 seconds. Position 2: 0.8 seconds Position 3: 2.0 seconds Position 4: 5.0 seconds Position 5: Automatic function of program Material: 2 seconds for individual peaks, 10 seconds for multiple peaks. Position 6: Automatic function of program Material: 0.3 seconds for individual peaks 10 seconds for multiple peaks 25 seconds for consistently high program level
Compressing/Limiting	Variable from 1:1 to 1:20 depending on DC threshold setting.

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Power	230 volts 50hz 1 amps (EUK) 120 volts 60hz 2 amps (US 110w)
Peak I	2 amp RMS (US) 120v
Stability	Unit maintains gain stability, gain reduction stability and balance over a wide range line voltage

CONTROLS

1 Input gain controls	Original tapered step attenuator: ∞ to 0 db
1 AC Threshold controls	Stepped 21 position
1 DC Threshold controls	Continuously variable
1 By-Pass switch	Switches AT-1 completely out of circuit
1 Ext i/p switch	Provides a 2 nd balanced i/p and splits up the GR and AC threshold circuits within the AT-1 when active.

1 Time Constant Switches

6 positions each, so as to provide fixed and variable time constants for any type of Programme material.

1 Metering Switches

3 positions which allows measurement of plate current for each set of 6386 gain reduction tubes.

Stereo Link Switch	2 or more independent AT-1 limiters
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XLR left and right in and out	Pin 2 Hot (EUK) Pin 3 (US)
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Dimensions

Standard 19" rack. 6U panel space and 11" depth behind panel

Weight	Approximately 20kg.
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Tube complement	4-6386LPG; 1-6084; 1-5651; 1-12AX7; 1-12BH7;1-6BL7; 2-6L6GTA; 1-GZ34.
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All i/p's & o/p's fully transformer balanced

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Safety first!

Like all tube equipment extremely high voltages and potentials are present inside this equipment, no attempt should be made to adjust the unit internally without the help of a properly qualified service engineer. If in the unlikely event adjustments need to be made please contact info@analoguetube.com first.

Looking after your AT-1 Limiter

Your AT-1 limiter should give you many years of uninterrupted service when observing the following simple guidelines:

Operational Guidance.

Whilst your limiter is capable a great deal of limiting it also performs as a very clean and dynamic line amplifier giving around a 20db increase.

However when heavy limiting is used a very high –Ve voltage is fed back to the grids of the 6386 gain reduction tubes. As the input sensitivity becomes quite high at this level it is generally not desirable to operate the Attenuator controls close to ‘open’ (fully CW) whilst in this mode. This can allow a significant amount of signal through the Attenuator’s. The If and hf performance and general operation will be greatly enhanced giving you more flexibility with greater Attenuation if these controls are operated conservatively. For example; try to increase your signal level into the unit, the input headroom has an excess of 20db!

- Do not move the unit whilst ON
- Do not move the unit whilst hot
- Do not operate in small un-ventilated spaces
- Allow the unit to cool down before moving
- Fit soft rubber wheels to your free standing trolley
- Allow free cool air to flow over unit when ON
- Operate at the correct voltage!
- Always fit correct tubes to your unit
- Always switch unit OFF when not in use
- Always use the Peli 0370 flight case for transportation
- The AT-1 is very heavy around 20kgs, use 2 people when lifting or when fitting unit to a rack

Temperature

When installing the AT-1 Limiter, please ensure that adequate ventilation is available. These units consume around 110w (120vac 60Hz) of power. This equipment should not be operated in an unventilated area like a flight case.

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A 1U low noise 3 fan unit can be provided, These 19" rack units are operated at a ¼ of their fan speed and sit approximately ½ u above the unit. If the limiter is to be fitted into a free standing rack, It is recommended the limiter occupy it's own space and not share it with other equipment it should have a vented 3U space directly below the unit and a vented 3U space above to include a fan rack.

If the Limiter is operated in a stand alone trolley, it can be operated at a 60 degree angle with fan assistance, as described above.

There are 12 tubes and a regulating power transformer for the 6386LPG tubes. The chassis will become warm during operation – this is normal.

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Simon Saywood - CEO Analoguetube Ltd
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