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AT-101 Stereo Limiter

User Manual

Serial No _____

Thank you for purchasing the AT-101. This compressor and its development represent state of the art passive design using tried and tested tube technology that also includes the development of the 6386LPG dual triode that has taken several years of research and in many ways is at the heart of the operation of these compressors. The operation and performance of this equipment is the same as similar units of the day, but now has a new creative element in the production of music 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 indispensible tool.

Each half of the AT-101 uses a 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 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.

Like the original, the AT-101 incorporates two independent feed back limiters which can compress or limit depending of the AC and DC threshold positions for two independent signals of a stereo signal or together when the stereo link or LAT/VERT is switched in and like the original 670, is designed to be placed in any normal line level circuit across the mix bus or insert.

Threshold Adjustments

It is possible (with careful adjustment of the AC and DC threshold controls) that the AT-101 can be used in any compression or limiting situation. The left right DC threshold controls are found behind the lower service panel on the right.

1. Set the AC threshold control to zero and adjust the input gain control for unity around 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.
5. Repeat for both channels.

Normal operation

For normal operation adjust the attenuator controls for unity – around 16 - advance the 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. 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 that great sound!

Your limiter is a versatile tool and is capable of handling and manipulating a large variation of signal program, its performance and operation is dependendant on several factors; Attenuator position, AC/DC Threshold's and the Attack/Release controls. 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 (behind the lower service panel) are generally set for the 1 o'clock position) this has been set in this way for general equipment performance.

For a drum group for example you may wish to use some heavy limiting to fatten up the track. 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. This is achieved by feeding a very high –Ve voltage back to the grids of the 6386 gain reduction tubes. Whilst you're limiter is capable a great deal of limiting it also performs as a very clean and dynamic line amplifier giving around a 20db increase. As the input sensitivity becomes quite high at this level it is generally not desirable to operate the Attenuator controls close to 'open' whilst in limiting mode. This can allow a significant amount of signal through the Attenenuator's. The lf and hf performance and general operation will be greatly enhanced giving you more flexibility with greater Attenuation. For example; try to increase your signal level into the unit, the input headroom has an excess of 20db! You will find after some experimentation that this may also increase the flexibility of your controls.

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-101 limiter comes fitted with XLR connectors at the rear of the unit. EUK models are pin 2 hot whilst US models are pin 3 hot. The AT-101 limiter is fully balanced in and out, as well as working normally in mix insert applications.

These limiters are supplied with their own shipping 3x2 wheeled flight cases, 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.

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Adjustments

There is very little in the way of internal adjustments, except for two single pots controlling voltage regulation and heater voltage for the gain reduction stage. In all cases a 2.5mm Allen key is needed to open both front panels for access.

1/ The adjustment marked ‘240vdc Adjust’ this is located behind the service panel on the right hand side. This adjustment has been set. Occasionally though it may need to be checked. To check this voltage: pin 8 of V302 (EL34) should read 222vdc and adjust if necessary.
2/ The adjustment for the gain reduction stage heaters is located near the power supply stage on the left inside the unit behind the instrument panel. This adjustment has been factory set and should not be changed.

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AT - 101 HPF OPTION

AT-101 STEREO LIMITER with HPF side-chain mod with Variable High Pass filter 20hz to 350hz 12db/oct

Internal active HPF side-chain filter description and operation.

This unique HPF modification allows you to filter low end pgm material between 20hz and 350hz from the side-chain re positioning your compressor trigger point furthur up the frequency range. The side chain filter is very simple to operate filterering out a low range of frequencies before the control amp.

Application:

The filter can vary anywhere between 20hz to 350hz - depending on the position of the controls. The filter uses a 12db/oct slope to filter out very low end before the side chain IP stage. The position of the variable controls depends on where the DC threshold controls are set (knee) set more CW and the knee becomes severe and the compression ratio increases and a correspondng change to the frequency position around the s/c controls can be expected.

As the AC threshold (ratio) controls are adjusted CW only the upper lows>mids and upwards are compressed.

Once the s/c filter is switched in it is always filtering.

Operation:

Each variable filter is independently adjustable for LEFT and RIGHT. When normal compression is required the active filter is switched out.

The 2 switches on the lower service panel switch the filters IN and OUT one filter is for the left channel and the other for the right. The s/c
controls set up the freq of LF to be cut 20hz to 150hz. The freq position and amount is variable so a little experimenting should be done with the DC threshold controls and your source material to see what works well. With the DC thresh set to 3pm 90hz is at about 12 oclock. The compression knee becomes sharper depending on how CW the DC thresh is set this in turn effects the filter.

When the s/c controls are set to fully CCW (your starting postion) the internal filter is set to cut everything below 60hz at the -3db point.
When the controls are set fully CW the internal filter is set to cut everything below 150hz at the -3db point.

For example where you need to introduce LF roll off ONLY prepare the unit as follows;

1/ Switch filters and Stereo Link OUT Adjust filters fully CCW
2/ Run the program with AT-101 in normal mode.
3/ Adjust the Atten controls to mid point.
4/ Switch TC to 3
5/ Adjust your AC threshold (ratio) controls again until you see the meters just moving.
6/ Switch in the HPF and carefully adjust the left s/c controls CW untill you see the meters not moving during LF passage.
7/ Adjust the corresponding right s/c CW untill right channel metering is just matched.
8/ Switch the stereo link IN

Filter operation is 90Hz (CCW and everything below) > 350Hz (CW and everything below) Broad opertion is when the filter controls are fully CW

Some program may have high levels of LF content disrupting the overall sound image, with the variable HP side-chain filter small adjustments can be made to filter high levels of LF signal when present allowing the compressor to be driven harder.

Understanding the original performance of the AT-101/AT-1/670/660:

Your AT-101 is a feed-back limiter. Naturately gradually limiting material between the 500hz to 5khz region everything outside this region is gradually less processed when the compressor is pushed. The introduction of an adjustable HP filter complements the gentle low end slope of this and will work in oposition to the control OP transformer making the compressor work less in the LF region.
As a consequence to this care should be taken when decreasing the HP filter controls CCW.

NOTE: As your vca tubes are matched tighten up the low end and help improve stereo image by switching in the stereo link.

Lat/Vert overide:

The filter is 'locked out' when Lat/Vert is enabled as each channel is now electrically connected together in this mode. In Lat/Vert processing mode the left channel becomes the SUM of the left and right and the right channel becomes the SUM of the out-of-phase signal.

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SPECIFICATIONS

Input impedance	600ohms
Output impedance	600ohms
Source impedance	<4ohms
Input level	>28db before clipping
Output level	Output 27dbm before clipping
Gain	18 db (no limiting)
Frequency response	20hz to 40khz <1 db (Straight line amp)
Thd+N vs Freq	<70db @ 10khz
Limiting noises	Below audibility
Attack times	.2 milliseconds in positions 1, 2, and 6. .4 milliseconds in positions 3 and 5 .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.
Separation	Left-Right position: 60 db
Power	230 volts 50hz 1.5 amps (EUK) 110 volts 60hz 3 amps (US)
Stability	Unit maintains gain stability, gain reduction stability and balance over a wide range line voltage

CONTROLS

2 Input gain controls	Original step attenuator: 1 db per step.
2 AC Threshold controls	Continuously variable
2 DC Threshold controls	Continuously variable

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

2 Metering Switches
3 positions each which allows measurement of plate current for each set of 6386 gain reduction tubes

Stereo Link Switch	2 independent limiters or stereo linked.
LAT/VERT switching	MS processing
XLR left and right in and out	Pin 2 Hot (EUK) Pin 3 (US)

Dimensions
Standard 19” rack. 14” panel space and 11” depth behind panel

Weight	Approximately 30kg.
Tube complement	8-6386LPG; 1-6084; 1-5651; 2-12AX7; 2-12BH7;1-EL34; 4-6973; 1-GZ34.

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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-101 Limiter

Your AT-101 limiter should give you many years of uninterrupted service when observing the following simple guidelines:

- 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 supplied flight case for transportation
- The AT-101 is very heavy around 30kgs, use 2 people when lifting or when fitting unit to a rack

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Temperature

When installing the AT-101 Limiter, please ensure that adequate ventilation is available. These units consume around 300w of power. This equipment should not be operated in an unventilated area like a flight case.

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 20 tubes and a low noise linear power supply regulating power for the 6386LPG tubes. The chassis will become warm during operation – this is normal.