On arrival, the Summit tube levelling amplifier brought floods of nostalgia, memories of recording sessions completed in a few hours using a 4- or 8-track machine and of such warm and trusty tools as the AKG *C28* valve (tube) operated condenser mic. In the effects rack there would sit a Fairchild compressor, a clapped-out recorder used for tape delay and flanging, a couple of passive inductor/capacitor type graphic equalisers and little else. The Summit *TLA-100A* is designed to elicit just those feelings, since it is styled very like the old Fairchild, with simple, chunky control knobs and full sized toggle switches. And the sound? Well, let's say that it definitely has a sound of its own—it is an effects device as much as a dynamics controller.

Summit Audio TLA-100A

Sam Wise gives a technical report on this Tube Levelling Amplifier

Construction

Ruggedly built, the Summit has a 5 mm thick satin anodised aluminium front panel and an all-steel chassis. The panel legend is of black anodising with blue highlights, so should be quite durable. There are lots of ventilation holes to let out the heat, so if you buy one, leave space above and below it. Visually, it is more homely than beautiful.

Front panel controls are simple. On the left are three large toggle switches. From top to bottom they are ATTACK—fast, medium and slow; RELEASE—fast, medium and slow; and METER—output or reduction. To the right is the GAIN control scaled 0 to 10. This operates post-compressor to restore the gain. Next is the vu meter, showing output level or gain reduction, then the GAIN REDUCTION rotary control again scaled 0 to 10. Finally at the right end of the panel there is a large red POWER ON indicator (relampable from outside), with LINK/IN/BYPASS beneath, and lastly a POWER ON-OFF switch.

The rear panel has a screen printed legend. At the left is a 115/230 V line voltage selector with adjacent 1¼ inch mains fuse and IEC mains connector. No fuse rating is printed on the panel. To the right of this is an output BAL/UNBAL switch, *XLR-3* male output connector, 2-pole 6.3 mm jack STEREO LINK and SIDE CHAIN ACCESS connectors, and lastly a differential balanced *XLR-3* female input connector. The *XLR*s are wired pin 3 hot, which is not now standard.

Internally, all the electronics are mounted on a single glassfibre PCB complete with component legend. There are three custom-built encapsulated units on the PCB, one labelled VCA, the other two labelled OP1 and OP2. Front panel controls and rear panel connections are hand-wired to the PCB in an orderly manner. The 'tube' is retained by a spring loaded cover and is easy to replace. The lamps for the vu meter are push-fit into a PCB mounting socket for ease of maintenance but could be prone to falling out due to shock or vibration. There are also two internally mounted fuses in addition to that on the rear panel. Internal safety is good, with insulation protecting

Manufacturer's specification

Output: +4 dBm corresponds to 0 vu balanced or unbalanced, transformer balancing optional
Output impedance: 75 Ω
Recommended load: ≥ 600 Ω
Maximum output: +25 dBm
Input: Electronically balanced or unbalanced
Impedance: 20 kΩ
Maximum input level: +26 dBm
Dimensions: 19×3½×10½ in (whd)
Power: 35 W, 155-230 V, 50 or 60 Hz
Shipping weight: 16 lb
Summit Audio Inc, PO Box 1678, Los Gatos, CA 95031, USA.
UK: Music Lab Sales; 72-76 Eversholt Street, London NW1 1BY.

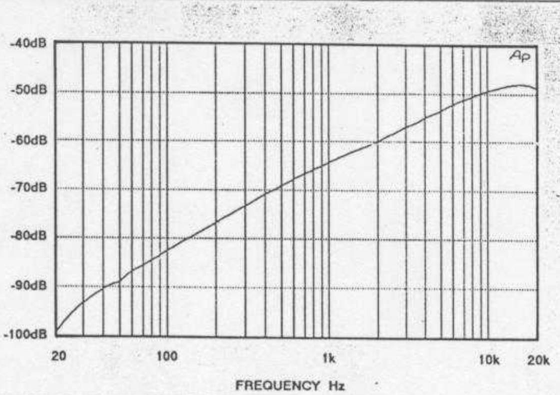

Fig 1: Input CMRR
Input level +18 dBu

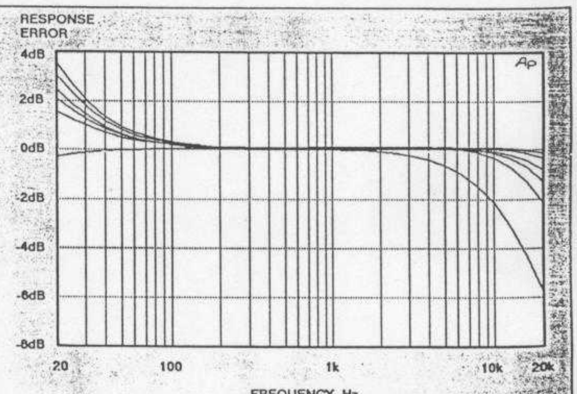

Fig 2: Frequency response with varying levels of gain reduction
Frequency response (dBr ref 1 kHz)
Gain reduction set at even integral values 0 to 10 with lower curve at 20 kHz being 0 GR

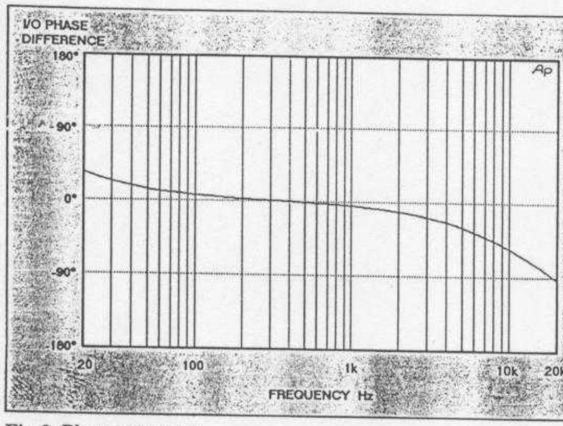

Fig 3: Phase response

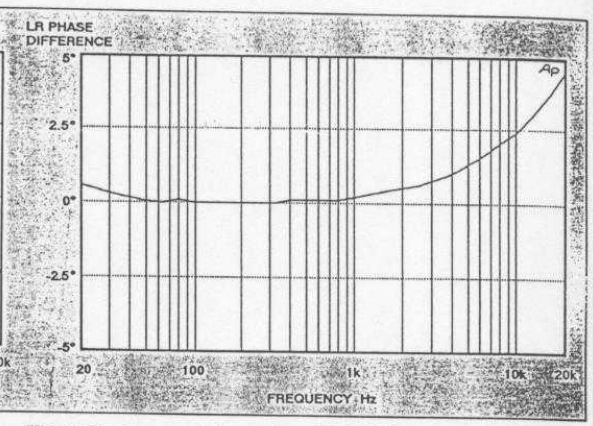

Fig 4: Phase error between two TLA-100A units in linked mode

all components carrying mains power. The mains cable is removable, connecting via a standard IEC socket. All in all, the unit should travel well if one is willing to forego vu illumination or solder the lamps in.

Circuitry

The Summit tube levelling amplifier combines largely solid-state circuitry with an electronic valve (tube) acting as an internal voltage amplifier. Thus it adds 'valve sound' to its 'soft-knee' compression characteristic, giving a particular type of compression effect. Design differences among compressors and limiters lead to preferences among users as to which unit they will use to produce a particular sound for certain types of source material. In the *TLA-100A* the difference—a valve sound—is a feature rather than a design by-product.

The compression circuitry is probably solid-state, being hidden within an encapsulated unit. As is clear from the manufacturer's specification, not much is defined—you are meant to judge this unit by its sound. To quantify the performance, the normal series of measurements were performed.

Inputs and outputs

A differential input is provided, with an input impedance of 40 kΩ balanced, or 20 kΩ unbalanced, confirming and clarifying the specification. This is adequately high. Fig 1 shows the common mode rejection ratio, which is excellent at low frequencies, decreasing at 20 dB/decade in common with similar circuits.

Input overload occurred at +26 dBu, which is certainly high enough and as specified.

The output amplifier is constructed from two cascaded *990* encapsulated op-amplifiers configured in inverting mode. A rear panel BAL/UNBAL switch bypasses the second inverting stage, connecting the return pin to earth. Output impedance measures 75 Ω/leg, or 150 Ω for a balanced output. This is a little higher than normal and results in the open circuit output voltage of +26 dBu being reduced to the specified −25 dBu when a 600 Ω load is connected. Still, the output level and impedances should not cause a problem.

The vu meter is specified to have a calibration of 0 vu=+4 dBu. This measures +3.98 dBu, which is within our measurement tolerance of specification. Meter accuracy is also excellent and the ballistics match vu specifications.

Frequency, phase and gain

With gain reduction set to 0 and gain set to unity, the frequency response falls off at high frequencies, being 6 dB down at 20 kHz. Investigation shows that as gain reduction is turned up, the high frequency response flattens but a bass boost is introduced. This reaches a maximum of +3.7 dB at 20 Hz at maximum gain reduction. This is shown in Fig 2.

Fig 3 shows the phase response with gain

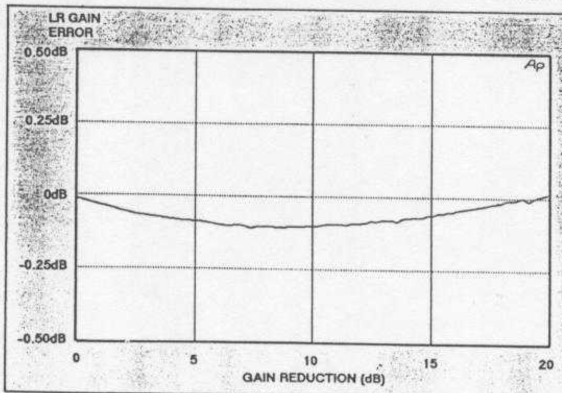

Fig 5: Stereo tracking error
+18 dBu input, frequency 1 kHz

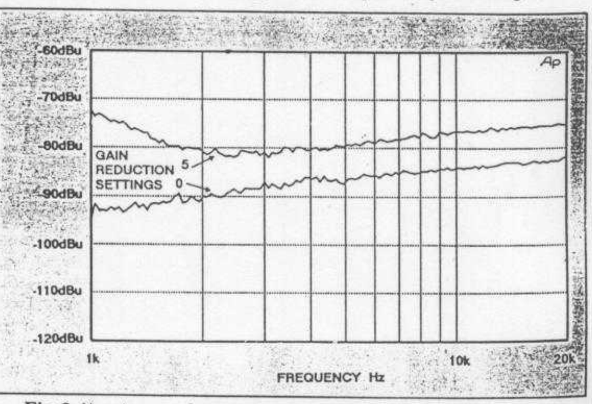

Fig 6: ⅓-octave noise spectrum
Gain unity, 60 Hz, 0 dBu tone
Rise at low end due to high level of 8th harmonic (480 Hz)

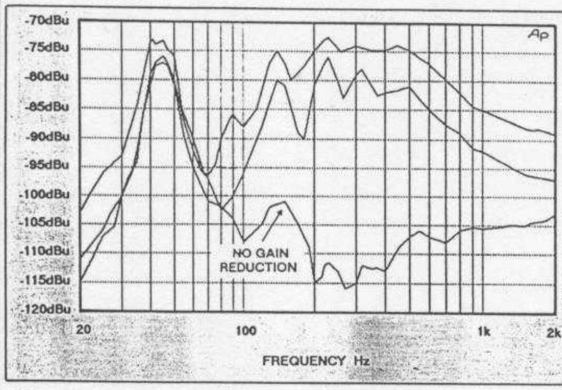

Fig 7: ⅓-octave noise+distortion
Harmonic products of an LF tone
400 Hz, 18 dB/octave filter in circuit

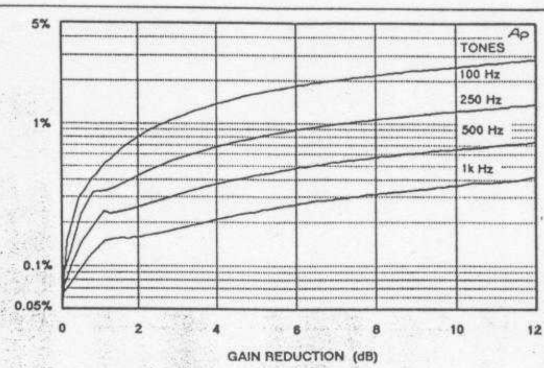

Fig 8: THD+N vs gain reduction at various frequencies
Measurements are not noise limited in any way

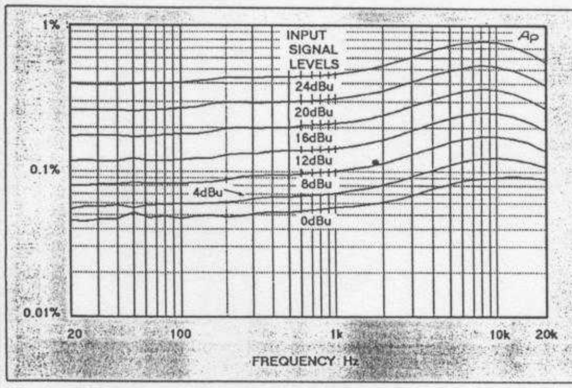

Fig 9: THD+N for various input levels
Unity gain, no gain reduction
Input levels mainly second harmonic

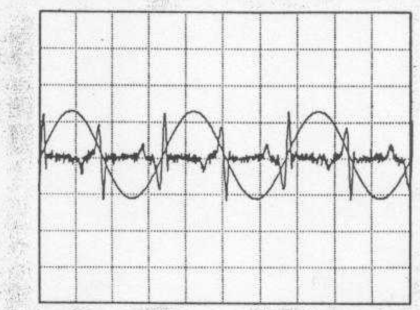

Fig 10: Scope traces of crossover distortion

reduction set to 0. As expected, the phase tracks the frequency variation. To check stereo tracking, two Summit units were patched together using the rear panel stereo link connectors. Fig 4 shows the phase difference between two units versus frequency, while Fig 5 shows the gain error as a function of gain reduction. Both results are excellent. There is no reservation in recommending these units for stereo applications.

Noise and distortion

As might be expected, noise and distortion are a function of both signal level and control settings. At unity gain and with no gain reduction, the broadband noise is as shown in Table 1. A ⅓-octave sweep of this noise reveals that it is essentially white in character, with a small 60 Hz component at −90 dBu.

To investigate the effect of the dynamic control systems on noise, a low frequency 'probe' tone of 60 Hz is used to set the gain reduction. The 60 Hz tone is removed using the THD+N notch filter, allowing investigation of changes of THD+N with gain reduction and signal level.

Fig 6 shows two curves. The lower one is without any gain reduction. In the upper curve, the gain reduction control is set to position 5. The input signal level is 0 dBu and the actual gain reduction about 7 dB. This loss is made up by adjustment of the gain control. As is apparent, the broadband noise has increased by 7 dB, indicating that most of the noise is generated in the input and compression cell stages and is not really affected by the amount of gain reduction. The rise in the LF end is actually caused by the 7th and 8th harmonic distortion products of the 60 Hz probe tone.

Fig 7 shows the detail of the lower frequency effects. Note that generally, odd order harmonics are produced. These low frequency distortion products have nothing to do with the quality of the Summit unit but result from the effect of the compressor attack and release time constants on a low frequency tone and will be common to any compressor with similar settings. Neither is the effect of the valve (tube) shown in any of these measurements, since it follows the gain control, it is operating at a constant level.

TABLE 1 Broadband noise performance
Unity gain, no gain reduction
Source resistance 50 Ω

22 Hz to 22 kHz BW, RMS	−74.8 dBu
400 Hz to 22 kHz BW, RMS	−74.9 dBu
CCIR 468-3, Q-peak	−63.5 dBu

Fig 8 shows that as frequency rises, there is a reduction in the distortion caused by the compression process itself. At higher frequencies the result appears to be almost entirely noise.

In Fig 9, a swept sinewave signal is used, with the gain control adjusted for unity gain at 1 kHz. The input signal level is from 0 dBu to +24 dBu in 4 dB increments. There is no gain reduction. This shows the effect of the valve (tube), which is generating mostly second harmonic distortion. This increases almost in step with the signal level.

Lastly, Fig 10 reveals that the residual distortion without gain reduction is largely due to crossover error in one of the internal amplifier stages. This is most certainly not a result of using a valve (tube).

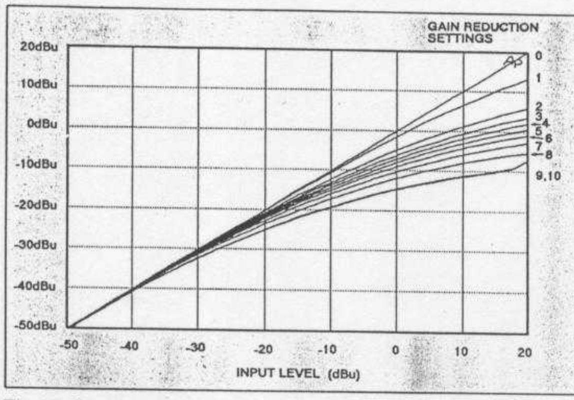

Fig 11: Compression curves
Unit gain set to 0
Note 9 and 10 are identical

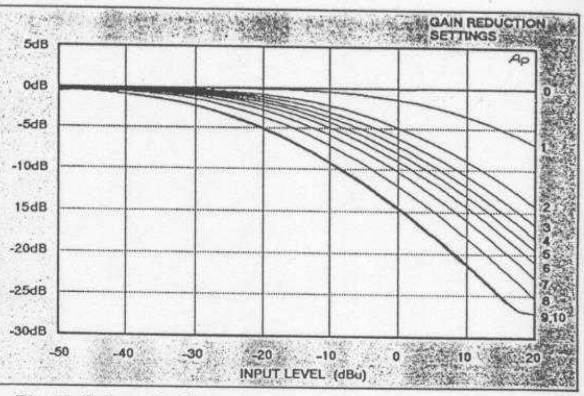

Fig 12: Gain reduction
Unit gain set to 0
Note 9 and 10 are identical

Controls and dynamics

In Fig 11, the compression curves of the *TLA-100A* are shown. The top curve is with gain reduction set to 0. As gain reduction is increased, the output level drops are expected. There is more effect over the first two calibrated positions but in general the control law is acceptable. **Fig 12** shows the same data but this time shows gain reduction itself as a function of signal level and gain reduction control settings.

The gain control provides a gain range from about +37 dB, down to −65 dB. This is adequate to make up for the maximum gain reduction of 27 dB and leaves a further 10 dB of gain in hand. The law is shown in Fig 13, and is quite reasonable over the top three-quarters of rotation.

Attack and release times are dependent on the programme itself and on the settings of the attack and release toggle switches. An example of attack characteristics are shown in **Fig 14**. In **Fig 14a** there is no gain reduction and the output signal is unaltered. In **Fig 14b**, the setting of gain reduction is maximum, and attack is slow. As can be seen, the signal level slowly declines, never reaching its fully reduced value. **Fig 14c** changes attack to medium and the signal now reduces to its minimum value during the first five cycles. When attack is switched to fast, the signal is almost immediately attenuated as shown in **Fig 14d**. The effect of various release times is similar.

The sound of Summit

Listening tests were performed using voice, acoustic guitar and a full range trad jazz recording. Unfortunately, flute or a similar pure tone type of source was not attainable in the time available. The *TLA-100A* gave a gentle warmth to the sound while controlling the level but presented no obvious sense of unpleasant distortion. There was a feeling of increased fullness, which was probably produced by the combined effect of decreased dynamic range and the second harmonic distortion introduced by the valve (tube). In general the sound was pleasant and noise not too obvious. If large gain reductions were used along with full level restoration, then the noise of the compressor began to be intrusive.

Final comment

The Summit *TLA-100A* tube levelling amplifier is a well engineered and well made effects unit, which will be the device of choice for certain applications. It will not replace the other level control devices in the studio, rather it will supplement them. There is little in engineering detail of this unit that can be criticised. If something will benefit from improvement, it will be the noise performance but even this really only gets obvious when large gain reductions are in use along with a large amount of make-up gain and that usually implies high level masking signals.□

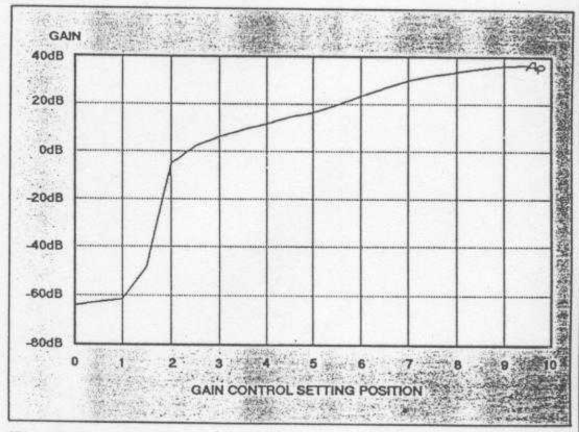

Fig 13: Gain control law

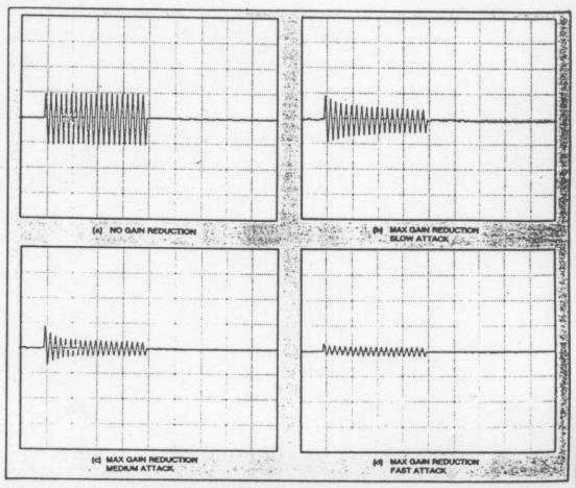

Fig 14: Attack characteristics
1 kHz sine burst: 20 cycles on, 1,000 cycles off