

Figure 1. The limiter described in the text.

A Neat Little Dual Limiter

16 channels of limiting in just 19 inches . . . no hiss, thump, or pump action. And all for about \$600.

WHAT THE WORLD NEEDS is just one more limiter. But *this one* is a *dual* ultra low noise pre-amp and limiter, utilizing two integrated circuits. Limiting is adjustable and extremely smooth. No hiss, thump or pump action. You have limiters in one neat little package, or 16 channels of limiting in just 19 inches of rack space at a \$600. The unit also serves as an excellent 1-

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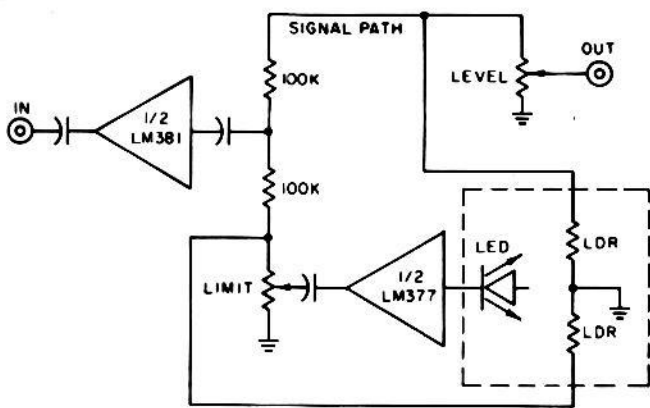


Figure 2. A simplified diagram of the signal path.

amp. With the limit pot closed, the signal passes, unprocessed, through to the output. The front panel has four controls and 2 leds. A limit pot and a level out pot for each channel and a led indicator for threshold of limiting for each channel is included.

A National LM381AN integrated circuit is used as a dual pre-amp. A National LM377 integrated circuit is employed as a power amp to drive the limiting portion of the circuit. The LM381AN offers two completely independent amplifiers, each with an internal power supply decoupler-regulator, providing 120 dB supply rejection and 60 dB channel separation. The pre-amp is a wide band high gain unit, which is unsurpassed where low noise performance is critical. Short circuit protection is also provided.

The LM377 is a wide band, low distortion 2-watt audio power amplifier with 75 dB channel separation. This device is used to drive the 2N3053 transistor and is not in the signal path.

HOW IT WORKS

The signal enters the 600 ohm input of the LM381 and is amplified. The output of the LM381 is picked off by the two 100k isolation resistors. One resistor feeds directly to the output pot. The other one feeds the input of the LM377 power amp. The power amp drives a 2N3053 transistor, which acts as a variable resistor and controls the brightness of the Clairex CLM8000 led (modified). The led is coupled to a dual element light-dependent resistor. As the signal level increases, the led gets brighter.

The brighter the led, the lower is the resistance of the ldr. One half of the ldr is swamped across the output control. The other half is swamped across the input of the LM377 power amp. As the signal increases, the led gets brighter and the ldr resistance decreases and acts as an attenuator to the input of the LM377 power amp, causing it to stabilize. Because the ldr is a dual resistive unit fed by a single light source, the same resistive information is passed on to the output pot of the pre-amp and the input of the power amp simultaneously.

When the power amp stabilizes, so does the output of the pre-amp. Any further increase of up to 40 dB at the input will show no increase in level at the output, and with no distortion. The front panel led fires with the CLM8000 led to indicate the threshold of limiting. Both leds are isolated from the signal path and therefore cause no distortion. Limiting is accomplished by pure resistive pads—nothing more.

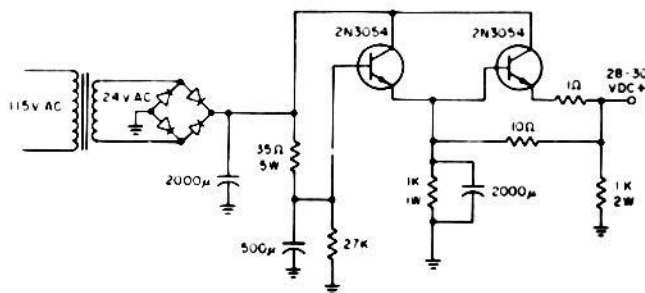


Figure 3. The power supply used.

ADJUSTMENTS

The following steps detail the adjustments necessary.

1. Turn the limit pot off.
2. Adjust your input control to normal.
3. Bring up the level pot of the pre-amp until your record meters are peaking at 0 vu.
4. Gradually bring up the limit pot until the front panel led is firing intermittently.
5. Watch your record vu meter and continue to bring up the limit pot until you have taken about 5 vu off the top.
6. The vu meter will now be peaking at -5 vu.
7. Turn up level pot until the vu meter again peaks at 0 vu.

Using this procedure, limiting does not occur until the

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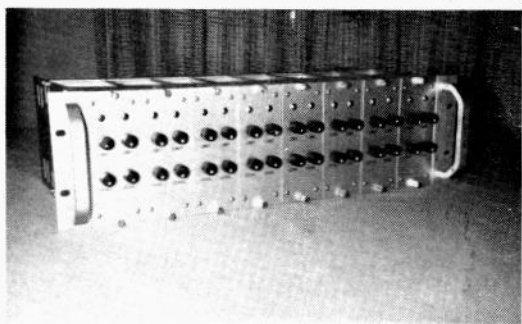


Figure 4. The completed 16 channels of limiting.

signal reaches -15 vu. From there on, the level is held at 0 vu, even though the input could increase 40 dB.

CONSTRUCTION

Parts should be mounted on a p.c. board ($4\frac{1}{2} \times 6$) keeping input and outputs physically separated as far as possible; of course, the standard p.c. board techniques apply. Resistors are the low noise metal film type (Dale). Capacitors are made of tantalum, for input and output. Standard p.c. board electrolytics are used for the other items.

Low Z-balanced inputs require a transformer. For low Z output use, use a suitable f.e.t. in a source follower configuration or transformer. Limiting is not affected by the impedance the pre-amp looks into. The CLM8000 Clairex led/ldr device comes from the factory with a single unit ldr. The single unit is removed and replaced with a Clairex CL704-2 ldr, a *dual* unit. The 500k pots are Centralab JMP-503 miniature linear taper. The units are mounted in a Vector CMK-3/CMG-7 cage. The front panel leds are Arcoelectric SL-43.

SCHEMATIC TEXT REFERENCES

The 10 pF capacitors connected between pins 5 & 6 of the LM381 determine the high frequency roll-off of the pre-amp. I use a 10 pF, which starts the high frequency roll-off at about 12 kHz. If you want to go all out, place a 0.047 capacitor across the 100k isolation resistors and a 4.7 pF in place of the 10 pF. The amp will then be flat from 30-30 kHz with some increase in noise. The gain may also be altered to suit your requirements.

Raising the 47k resistor in the feedback loop increases the gain. Lower the 47k resistor for lower gain. I have selected a trade-off value of 47k in the feedback loop so as not to overdrive most hi-Z mic inputs and still have enough gain for most line inputs.

For a power supply, I use a capacitor multiplier circuit. (See FIGURE 3). This power supply is as quiet as a battery, with no hum whatsoever.

It seems that no matter how good anything is, there has to be one little annoyance. The one difficulty with this unit is that *all* resistive light cells have a memory, for storage in darkness for an extended period of time. They will not stabilize instantly after being in the dark overnight. What you must do is to give them a few minutes of light before recording begins. This can be done by turning up the limit pots while the talent is tuning up or rehearsing. A half-minute or so is usually sufficient.

Those of you who don't care to chase parts, modify the led unit, make p.c. boards, etc. are welcome to contact me. I can supply the p.c. board and hard-to-come-by components on a professional basis. Write to: Robert R. Faulkner, P.O. Box 26, Redondo Beach, Ca. 90277. ■