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AMPEX Parts,Service & Sales

Helios F760-Limiter/Comp-SVS



General Description

This Helios F760 module was originally designed to the original specification which was originally in the Island Studio Basing St console. The unit is a 40x190mm module for insertion in a custom-built Helios mixing desk, or certain 19" Racks and Lunchboxes, i.e.
Helios Electronics Ltd, UK, Vintage King Audio USA, Morphon Studiotechnik Germany.
The unit comprises. a variloss FET controlled amplifier with associated side-chains and line-drive amplifiers. Basically the unit has unity gain with a "make-up facility of 30dB, the input and output are symmetrical and floating, it is designed for operation in a +4 to 8dBM line and operating below this level will increasingly impair the signal to noise performance. A gains reduction meter indicates 0 - 20dB Gain Reduction.

Operation

The unit should ideally be operated so that the, signal is reaching +4 to 8dBm
at the output; in this way optimum signal-noise ratio is maintained.
The Threshold and Make-up Gain will therefore be adjusted so that- for the amount of gain reduction required the signal 'still peaks to +8dBm at the output. The signal-noise ratio is nearly -80dB but falls to -70 odd when operating at a peak output level of around 0dBm.

Should it ever be required to work in line levels of -10dBm, then the +8dBm threshold should be still used, but the output attenuated to -10dBm or whatever; the make-up gain, being used to bring the signal level up internally.



Threshold

The threshold switch is calibrated in steps of 1dB between +8 and 0dBm; thereafter in 2dB steps down to -2OdBm. This is so arranged since the tighter slopes (3:1 to 20: 1) will only be used down to around 0dBm with the lower threshold levels used on 2:1 only, which will give a 1dB change at the output per step.

Ratio

The ratio switch selects a: range of compression slopes (1:1, 2:1, 3:1, 5:1, 10:1 and 20:1). The slopes are set-up relative to the 2:1 ratio which is established for 20:10 (i.e. 10dB gain reduction), below that amount of Gain Reduction the slope will appear slightly less than 2:1 or 3:1 etc.

Peak Limiter

In addition to the compressor side-chain the facility of an overload limiter is available.

This may be made operative by the switch on the front of the module. As supplied this has been pre-set to operate at a threshold level of +10dBm. Thus on tighter ratios (5:1, 10:1, 20:1) it will never operate, but is there to provide some overload protection on the 2:1 and 3:1 slopes.



Release

The recovery control provides a range of release positions from 25mS to 3.2 secs. (these are calculated on the CR time - for 12dB Gain Reduction to recover within 4dB of the un-attenuated position). In addition an 'Auto' position provides multiple network that has proved to be a good general purpose position. It allows fast gain change to occur over 5 or 6dB whereupon the release characteristic changes, becoming very slow. Thus. Modulation effects are reduced even when considerable overall gain reduction is being used. It is an effective mean level control.

Attack.

The attack time is more extensive on this model, -25, .5, 1, 2.5, 10 & 25, normally there are only 3 settings

Stereo operation.

Stereo operation is effected by linking the control volts between pairs of modules, gain reduction will be identical on both channels and will be controlled by the channel causing greatest gain reduction. Ratios and Threshold levels need not be identical, in fact one could set-up a 2:1 slope and threshold in one module with a higher limit (20:1) slope in the other: The two would combine to give 2:1 up to the 20:1 and thereafter they both would limit.

There are balancing transformers available as an accessory for both the output & the input

The input is a floating Sowter 10kohm impedance transformer mounted in the desk this obtains a floating symmetrical output. The output 3 position Toggle Switch mounted in the front panel can trim the output level. approx minus or plus 6dB to give a maximum output threshold level of +14dBm if necessary.

Operation Procedure:

Establishing the unit in the channel

Set Compressor Ratio switched to 1:1 (i.e. non-operative); the Peak Limit switched "In", the Input attenuators (in a stereo unit would be fully open on each channel with control effected on the ganged device) would be adjusted as required.

Set the Helios-F760 to by-pass by switching the Ratio at 1-1 and the threshold to "0" the channel levels should be establisher in the usual way as though the F760 were not in circuit. The channel level should be peaking to at least -10dBm, but preferably to OdBm in order to obtain maximum compression possibilities.

Set the Ratio to 20-1, the release to "Auto" and the Threshold to "2", now adjust the Input pot. until the overall amount of gain reduction likely to be required, is indicating on the meter (e.g. 10dB).

At this stage the Peak Limit section is working and the red indicator will be flashing.

Switch the Output Toggle to “N” or + and adjust so that the level is peaking to the same level as the direct signal. This is best done under dynamic signal conditions rather than on tone if monitoring with VU meters (see LIMITING & COMPRESSION - Considerations).

With the Compressor Ratio control select the Slope required (e.g 2:1) and adjust, the Compressor Threshold control until the Peak Limit only indicates on peaks above the amount of compression required (i.e. move the threshold down from '0 'towards the -20 point until the Limit light goes
out, then come back one position).
The limit section will then operate on any further unexpected increase in level. The amount of compression
may be changed by increasing/decreasing the Input pot. and adjusting the Compressor Threshold to adjust the relationship between compression and' peak limiting. Once set-up it will not be necessary to alter the Output level.

The Release time in the compressor section will be adjusted for effect and the Attack time. Note when long Attack time is selected more peak limiting will occur.

In adjusting the compressor section always reference it to the Peak Limiter even if the Pk.Limit is then switched out during operation. This maintains optimum signal-noise level in the system. When using tighter slopes in the compressor the Threshold will lie just under the Pk.Limit in position -2 to -8 (20:1 to 3:1 ratios). The Compression Slopes are calculated on a 15dB range of gain reduction. (i .e the 2:1 ratio is established in the set-up procedure as 30:15). It will be found in practice that the initial slope in that
position is more akin to 1:1.5 becoming slightly tighter as gain reduction increases.
Thus if only 6dB of compression were required this will be softer than the ratio indicated and the next position higher could be selected. In practice this will not be found of great importance; but it is useful to know of.

LIMITING & COMPRESSION – Considerations
The usual purpose of Limiting and Compression is to a). Increase loudness and b). to provide overload protection and generally control level.

LIMITING implies the use of a level control device to provide overload protection; its purpose to 'limit' the signal level at some specified point. Transients are the major concern (that is peaks of short duration) that exceed the pre-determined peak recording level. Control of these will not markedly affect the dynamic range of the input signal since gain reduction when is does occur, will be momentary and of a relatively low order of magnitude. In most cases a fast release time will be desired so that transients are punched down without apparently affecting the programme content. A tight compression ratio greater than 10:1 would be used.

Such an action enables the engineer to reduce his system 'headroom', operate with a higher recording level without fear of overload. The dynamic range of a recording or transmission system is thus increased.

COMPRESSION is used to describe conditions of gain reduction that are more or less continuous; thus the original dynamics are compressed. The compression ration selected may be anything from the softest slope. (say 2:1) to the tightest (say 20:1) dependent on the effect required.

When it is desirable to preserve some sensible relationship to the original dynamics, ratios of 2: 1 or 3: 1 would be used. There is some significant increase at the output as

the input rises on these slopes. 5: 1 to 20:1 are tighter and the output will not rise by much whatever the input level.

The diagram of the F760 slopes shows this clearly; 15dB compression on a slope of 10:1 would occur on the top 16.5dB of the signal; the same amount effected at 2: 1 is spread and affects the top 30dB of the signal. The 2:1 ratio is therefore more subtle and the effect of fast release times less apparent.

The advantage of the F760 Series over a straight Compressor-Limiter is that the softer slopes can be used to provide subtle compression combined with overload protection at the top.It is thus safe td use the soft slopes; and one does not have to compromise by using a tighter slope than one would ideally like.

RELEASE-TIME is important in compression since it determines the moment to moment gain change in the system; and it is the rate of gain-change that determines loudness. The faster the release and the tighter the slope the more lower level signal is brought up towards peak level. The problem introduced is that of 'pumping' or 'breathing' plus the effect of fast release times on low frequency distortion. With very fast release the low frequency wave forms are being flattened; this is naturally most noticeable under conditions of considerable gain reduction coupled with a tight slope and a fast attack time.

In practice it is surprising what one get away with in 'pop' applications where these sort of extreme conditions can be useful. With 'serious' programme material slower times will be used.

The automatic programme controlled release position 'A' provides for a fast release over a range of 5dB whereupon it becomes long. Thus short duration gain change is limited to a small amount obviating the most of the problems described. It can be adjusted to operate as a 'mean level' control such that the quieter sections are subtly lifted. Considerable overall compression can be effected without being apparent., and is ideal for back-ground music or reducing dynamics for mediums of very limited dynamic range (e.g AM transmissions and optical track etc.).

ATTACK TIME will determine the size of transients allowed to pass through the compressor section (to be handled by the Peak Limit section in an F760). In a limiter this should be very fast in order to control high frequency spikes and prevent overloading.

Some mediums are more critical than others; on tape it may be preferable to let the fastest through to saturate and be clipped in the tape itself; with optical systems and transmitters it is usually essential to keep overshoot to the absolute minimum.

In a compressor or limiter the slowing down of the attack time has the effect (dynamically speaking) of reducing the static ratio, increasingly overshooting.

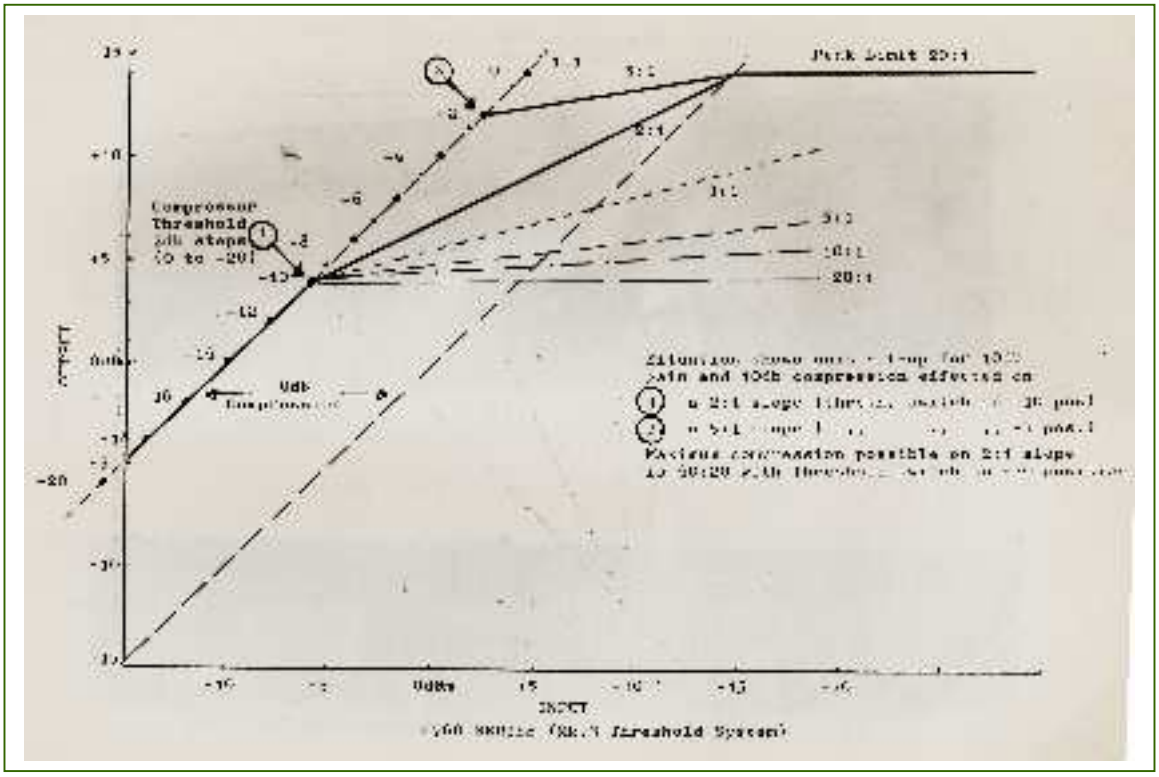
Listening to 15dB compression on a 20:1 slope with a fast attack time, the tightness will be quite apparent in the sound and this can be softened by reducing the attack time.

COMPRESSION & NOISE: From the point of view of minimal noise, it is preferable for the compression to be effected on direct microphone signal since the signal-to-noise ratio is better at this stage. It will be appreciated that 15dB

compression will increase the source noise by 15dB when the compressor fully recovers; off tape this would be more noticeable.

MODULATION: If more than about 6dB compression is used it is desirable to treat individual instruments or groups of instruments, separately in order to avoid modulation effects when a dominant instrument or sound modulates the rest of the signal. It is impossible to limit satisfactorily low frequency. instruments on a final balance.

Try limiting the low frequency sections of an organ recording or well modulated timpani in an orchestral recording; the effect on the remaining signal and particularly the change in ambience is most apparent. By separately compressing groups of similar instruments considerable compression may be effected on direct signal without difficulty.



Helios F760-Limiter/Comp-SVS Specification

Input:	**Impedance nominal 10K Attenuator continuously variable* Unbalanced, but provision for transformers in some formats (see STANDARD FORMATS) Gardner MU7530 or MU7550**
Output:	**Source Impedance less than 10 Attenuator continuously variable* Maximum output level +18dBm (+24dBm with Souter transformer to order) Unbalanced, (for transformer provision see STANDARD FORMATS) MU7524 or MU7544**
System Gain:	**Bypass mode — unity 34db unattenuated**
Thresholds (Mk.3):	**Compressor 0 to -20db in 2db steps relative to Peak Limit. Relative to input level (unattenuated) -20 to -40 dBm Peak Limit +14dBm max unattenuated Referred to input level unattenuated - 20dBm**
Ratios:	**Compressor — 1:1. 2:1. 3:1. 5:1. 10:1. 20:1 Peak Limit — 20:1**
Attack:	**Compressor — 250pS, .5, 1, 2.5mS, 10, 25mS Peak Limit — 25pS**
Release:	**Compressor — 25mS, 50mS, 0.1, 0.2, 0.4, 0.8, 1.6, 3.2, Auto Peak Limit — 25mS (fixed auto-network to order)**
Distortion:	**<0.3% for 10db compression at +14dBm output.**
Signal-Noise:	**Referred to limit level — normal operating level, -86db**
Frequency Response:	**30Hz — 30kHz 4-0, -0.5db**
Expander Section:	**Slopes 2:1. 20:1 Threshold variable down to -40dBm Release 25ms to 8secs Attack 20pS, 2.5mS 40mS Range 0 to -20db variable**
Indicators:	**Gain Reduction Meter scaled 0 — 20db Peak Limit indicator — red**
System Formats, Power Requirements, Size:	**See STANDARD FORMATS**

*** Switched attenuators to order**