I N S T R U C T I O N M A N U A L

S T L 8 4 1. +732

GENERAL.

The Regulated Filter STL 841 is intended for the insertion in a two channel audio frequency transmission line, in which a limitation of the levels especially in the treble region is desired. The outputs of the filter may be connected directly or indirectly to the control inputs. According to the position of the "Threshold" selector on the front-plate the filter will react upon high signal levels by shifting its cut off frequency downwards just so far that level is attennuated to the desired maximum value.

Primarily the unit is constructed for use in disc cutting systems, in which it is essential that high peaks in the treble region are limited since such peaks may cause distortion when the record is played back, or even be impossible to cut because of the physical dimensions of the cutting stylus in relation to the groove speed. Peaks of longer duration may also overload the cutterhead and either cause a drop out of a thermal protection device or damage the cutterhead.

In a cutting device, the filter should be controlled by a voltage, representing the cutter current. Such a voltage is available from Phonotech cutting amplifiers.

The unit may also prove to be a valuable aid in other kinds of sound systems, e.g. tape mastering, FM broadcast, sound film, ect. The range of threshold levels selectable from the front-plate may be shifted by an internal potentiometer or by inserting an attennuator before the control input.

The filters will react on the control signal level according to the "Attack Time" chosen on a front panel selector. The range is 0.3 ms to 100 ms in 6 discrete steps, separated by a factor about 3. Similarly the recovery time or "Release Time" may be selected within a range from 3 ms to 1000 ms.

The attack and release times will be defined in the technical section.

Roughly, however, they may be regarded as the times required to shift the cut off frequency one octave downwards and upwards respectively when a sudden change in the input level occurs.

By using the threshold selector as well as the two time selectors, it is possible to obtain the optimal performance of the filter considering the musical requirements as well as the technical restrictions.

Two meters on the front-plate indicate the filter acting during operation.

UNPACKING THE UNIT.

The instrument is ready for operation immediately after unpacking. However, a visual inspection of the front and rear plates is advisable. If an inspection of the internal circuitry is desired, the top plate may easily be removed by inscrewing the "unbraco" edge screws.

INSTALLATION.

The Regulated Filter STL 841 is constructed for mounting in 19" rack.

The terminals: input, output and control are XLR sockets. Since the European and the American standards for the wiring of XLR are different, a label is attached to the unit indicating the actual connection. (See drawing no. 6926).

Also it should be checked that the unit is connected for the correct mains voltage (220-230 V or 110-115 V).

OPERATION.

When the unit is properly wired, mains may be switched on.

Note that the two panel meters indicate the cut off frequency of 20 kHz, i.e. full scale deflection.

In a cutting system, the function may be checked by turning up fully the threshold selector and sending a low level 12 kHz tone signal through the system to the cutterhead or to a dummy load. Both time selectors should be turned to minimum times. Observe the cutter current meters on the cutting amplifiers while increasing the level of the signal. The current will increase proportionally only to a small value and then remain almost constant. At the same time the meters on the STL front-plate will indicate a continuously decreasing cut off frequency. Now turn down the threshold selector until the desired maximum current is observed on the cutter current meters (e.g. about o.8 - 1.0 A).

In this position of the selector the unit will provide protection against thermal overload of the cutting head in case of a continuous signal. When music is transferred to the cutting head a lower threshold position may be chosen. It remains a question of judgement, at which position it is defensible to cut a given titel at a certain level. The cut off frequency meters have their scale red painted from about 7 kHz and down, because the action of the filter starts to turn audible if the limitation is driven too far. The filter itself will not change in its performance until the pointer is down at about 1 kHz, which is the limit of the regulation.

Consequently it is advisable to observe that the pointers do not enter the red painted area and it becomes important to observe that it never reaches the "bottom", i.e. below 2 kHz.

If the limiter is operated in a self-controlling mode and the limiting range determined by the threshold potentiometer is found to be below desired range, the control input signal may be attennuated through a simple external potentiometer.

DE-ESSING.

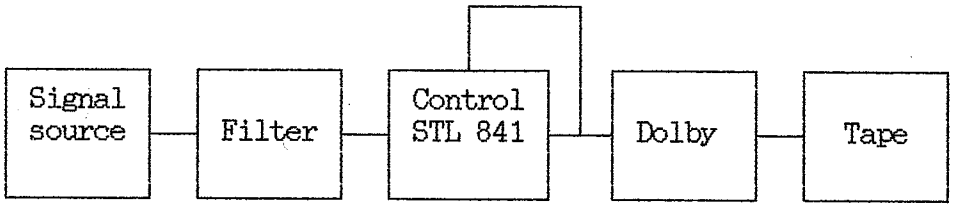
The STL 841 can be inserted anywhere in the signal-path but care must be taken not to place it inside dolby incoded signal lines.
This because the STL 841 will aulter the dolbysignal and thereby affect the decoding procces which later will take place.

As the "Control in" signal adjust the filter, it is the connection of this input which decide where the limition is actually made.

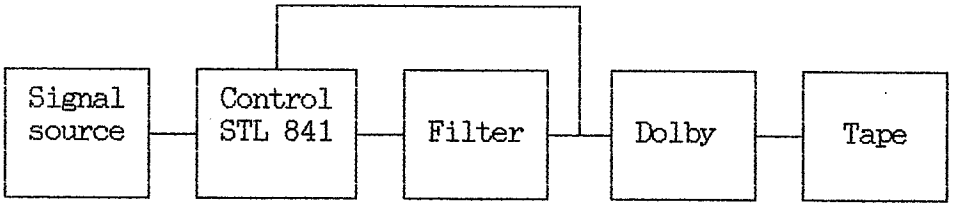
Therefore it is possible to insert an equalizer after STL 841 and adjust the level on this point by connecting the "Control in" to the output of the equalizer, as shown in figur 2.

The placing in figur 1 and 2 will result in the same adjustment of the signal.

Figur 1.



Figur 2.



The diagram (drawing no. 6924) gives in detail the circuitry of the main module A 0072. For reasons of clarity only one of the two channels is shown, while the other one is indicated by the rectangle (B-channel). The components of the A channel and B channel are numbered parallelly, e.g. R1 of the A-channel corresponds to R101 of the the B-channel. Similarly Q1 of A corresponds to Q11 of B. The components of the mutual circuitry, such as the ramp generator is numbered starting with R 201 or Q 21.

Terminals of the module are formed by two 31-pole connectors, I and II (I is to the left).
In the following description references are made only to the A-channel, knowing that A and B channels are identical.

RAMP GENERATOR AND PULSE MODULATOR.

The pulse width modulator is designed to produce two outputs of well defined pulses changing between about -14V and a slight positive voltage. The pulse repetition rate of the channels are the same, defined by a clock pulse generator. The duty cycle, however, varies individually according to the dc voltage fed to each of the control inputs.

The ramp signal is passed through a voltage follower on to the non-inverting input terminals of the comparator.
The inverting input of the comparator is connected to the output from the control amplifiers.

The output of each comparator is negative as long as the ramp potential is lower than the input. As soon as the ramp voltage supersedes the input signal, the comparator output turns positive. Each comparator output signal is then amplified and shaped through the networks including Q3, Q4, Q5.

The output signals delivered from the pulse shaping circuits thus start negative and switch to positive after a certain delay. The signals are also fed to FET Q6 and through the RC pairs R31-C13. A dc current is produced in the FET according to the duty cycle of the pulse signal. A meter is connected to the FET in such a way that the deflections are full scale when the FET are completely off.

CONTROL AMPLIFIER.

The control amplifier section has its input through C1 to H1 and its output from H5, which delivers a dc signal, analog to the control input signal, to the inverting input of the comparator.

The first stage, H1, amplifies the signal while H2 is connected in an active HP filter configuration (C4, C5, R5, R6) with a cut off frequency at about 5 kHz. The input amplifiers H1 has a slight roll off in the high end, and the two stages provide a resulting response with a slight peaking between 8 and 12 kHz.

From H2 the signal enters the full wave ac to dc converter, formed by H3, H4. The output from the converter is connected to a capacitor C9 via the voltage follower Q1 and the charging/discharging diodes, resistors and external front panel meters. The charging and discharging respectively of C9 are determined individually and corresponds to the attack time and the release time respectively.

The final dc amplifier, H5, includes a potential shift of the output to match the requirements of the comparators. When no signal is supplied, the potential is negative. At the "threshold" potential, the comparator starts to operate.

The potential shift is carried out by the transistor Q10 and the "threshold" potentiometer. The potentiometer thus determines the threshold level at maximum regulation ratio.

MAIN FILTER.

The main filter has the property that its cut off frequency may be varied by an external control voltage.

The variable filter section is composed by H9, the adjacent resistors (R44-R50) and capacitors C21 - C23. The resistors R47, R48 and R49 may each be shunted by R44, R45 and R46 provided the sections of the triple MOS-FET switch, H8, are conducting. If non-conducting, only R47, R48 and R49 define the cut off frequency together with the mentioned capacitors.

The MOS-FET switches are rapidly operated by the incoming pulse width modulated control signal (R80/R81). The resulting value of a resistor section for example R47 - R44 is defined by

$$R_0 = \frac{R47 * R44}{dR47 + R44}$$

where d is the duty cycle of the pulse signal (=duration of the negative cycle to be transferred by the filter, 80 kHz.

To prevent the formation of difference tones in case the programme signal contains high frequency components (e.g. bias frequencies from a tape machine), a pre-filter and a pre-amplifier are added before the variable filter. A dual Ic is used for this purpose.

From the input terminals the programme signal is fed to the pre-amplifier, which is the first half of the Ic, H7. Since the standard programme level may vary from one system to another, a strapping system is avaible, by means of which the programme level is matched to the optimum working level of the filters, which is about 0 dBu. When strapping +6 dB, a gain of 6 dB is produced by the preamplifier. -6dB strapping reduces the level 6 dB, while the mid position maintains the level unchanged. In each condition the input impedance remains 50 k ohm.

From the preamplifier, the signal is fed to the prefilter, formed by the second half of H7 and the adjacent resistors, R40 - R42 and capacitors C15 - C20.

The signal then passes the variable filter already described and from here it enters an output filter and an output amplifier. The output filter, formed by one half of another dual Ic, H10, is identical to the prefilter. The purpose of this filter is to attennuate HF components from the control signal which may have passed the gate source capacitance of the MOS-FET switch.

In front of the output amplifier a strapping system is again inserted, by which the output level may be readjusted to the original input level. If the signal was attenuated in the preamplifier it should be amplified correspondingly.

The amplifier is formed by the second half of the dual Ic, H10, together with the two complementary transistors Q7 and Q8, and supplies the output at line level.

The prefilter, together with the output filter, provides a sharp cut off (Butterworth response), normally adjusted for a -3 dB point at 22 kHz.
The roll off rate is about 36 dB/octave. The two filters may easily be readjusted to another cut off frequency by changing the R components (all R's should be equal). This may be useful in case of quad-recordings where a sharp cut off at 15 kHz is required for the LF programme component.

The variable filter is normally of the Bessel type, which has a favourable almost linear phase response.

The roll off rate of the variable filter section is 18 dB/octave. The roll off shape is however more than of the Butterworth filters.

A relay, G1, is mounted on this circuit. When the circuit is not powered, the relay drops out, and its contacts will bypass the entire circuit from input to output. In this condition the programme signals will thus be transfered as if the filter was non-existing.