The Sony Oxford EQ
System Overview

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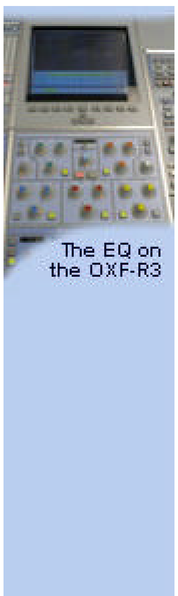
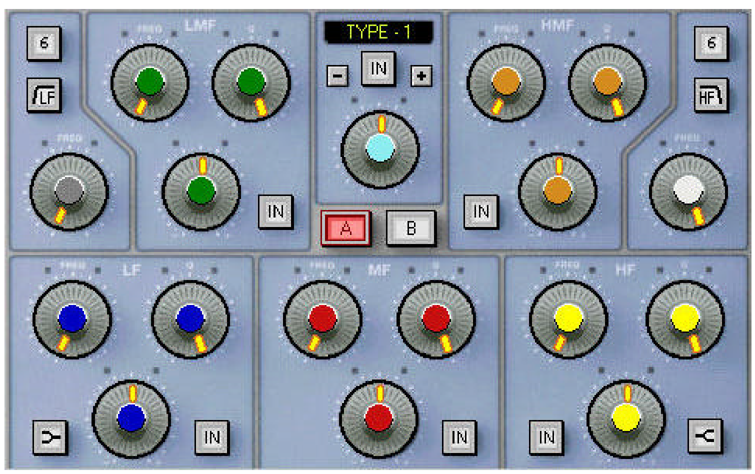
The Sony Oxford OXF-R3 EQ

The Oxford EQ



The Oxford EQ is a full 5-band EQ with selectable shelf settings on the LF and HF sections. Additionally, separate variable slope low pass and high pass filters are provided. The EQ also features 4 different selectable EQ types that cover most of the EQ styles currently popular among professional users, including some legacy styles which are renowned for their artistic capability. The use of novel coefficient generation and intelligent processing design provides unparalleled performance that surpasses analog EQ in both sound quality and artistic freedom. This EQ may well provide all the EQ you will ever need.

Every channel has two EQ memories, selected with the A and B switches. These memories allow the operator to experiment, without losing the previous settings. During mixing an alternate EQ can be recalled either manually or by the console automation. And of course every control on the EQ can be statically or dynamically automated.



Section	Gain	Frequency	Q/Slope	Overshoot
LF Filter	6dB/Oct steps	20Hz - 500Hz	0 –36dB/Oct	
LF Peak/Shelf	+/-20dB	20Hz - 400Hz	0.5 – 16	0 – 50% (Q adjust in Shelf)
LMF	+/-20dB	30Hz - 600Hz	0.5 – 16	
MF	+/-20dB	100Hz - 6KHz	0.5 – 16	
HMF	+/-20dB	900Hz - 18KHz	0.5 – 16	
HF Peak/Shelf	+/-20dB	2KHz - 20Khz	0.5 – 16	0 – 50% (Q adjust in Shelf)
HF Filter	6dB/Oct steps	1KHz - 20KHz	0 –36dB/Oct	

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Sony Oxford / GML 8200 Option

The Sony Oxford / GML Option adds the GML 8200 EQ emulation to the Sony Oxford EQ. This highly accurate emulation, designed in collaboration with GML for the OXF-R3 console, has all the finer characteristics of the classic analog outboard unit. It faithfully reproduces all the control ranges and responses of the original EQ, even to the point of producing center frequencies up to 26KHz while running at 44.1KHz or 48KHz!

This superlative EQ, much loved for its sonic detail and sensitive musical character, has deservedly become regarded as indispensable among many professionals in the industry. This option, fully endorsed by GML, brings a vast wealth of experience and matchless lineage.

Features

Enhances the Sony Oxford's 4 EQ types by adding a GML-8200 emulation as an additional EQ type.

Common control interface features with the built-in Oxford EQ types.

Extremely accurate GML 8200 emulation with center frequencies up to 26KHz.

Highly accurate control range and law matching with GML 8200 to retain the operational character of the analog unit.

Extremely low noise and distortion of the Sony Oxford EQ processing, giving performance levels many times better than those attainable from the analog unit.

All controls can be dynamically automated or stored as snapshots for later instant recall.

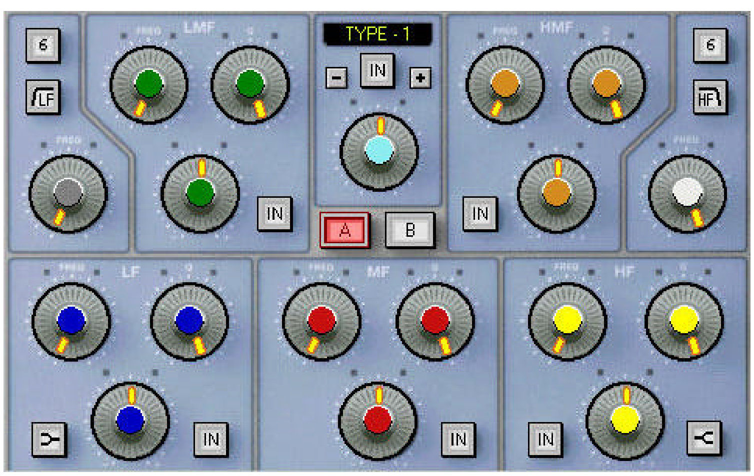
EQ in general.

Program equalizers have expanded, beyond their original use as distance correction devices for film and video, into highly creative tools that represent a leading part of the sound engineer's artistic palette. A great many EQ designs have been developed over the years that have been attributed with qualities that lend themselves to particular uses and sounds. The Oxford EQ is designed to be flexible enough to address as many of these generic types as possible by presenting a variety of types to the user.

The following text is presented as a general explanation of many of the factors that affect EQ performance and to illustrate how we have addressed these issues with the Oxford EQ.

Control ranges and interaction (types of EQ).

There are many different types of EQ, which differ in many areas. One of the most important areas is the issue of control ranges and interaction. While it is true that with a parametric unit with continuous controls (i.e. not quantized) any response could be obtained by matching their curves, many of the popular EQs have control dependencies that lean towards a specific application. One of the main areas where EQs differ is Gain / Q dependency. Most analog EQ has a Gain / Q dependency as a result of the circuits used. This factor can greatly affect the artistic style that an EQ presents by facilitating certain parameter settings and encouraging particular uses when the unit is operated. In the Oxford EQ we have covered this situation by providing 4 different styles of EQ that take account of Gain / Q dependency as well as overall control ranges.



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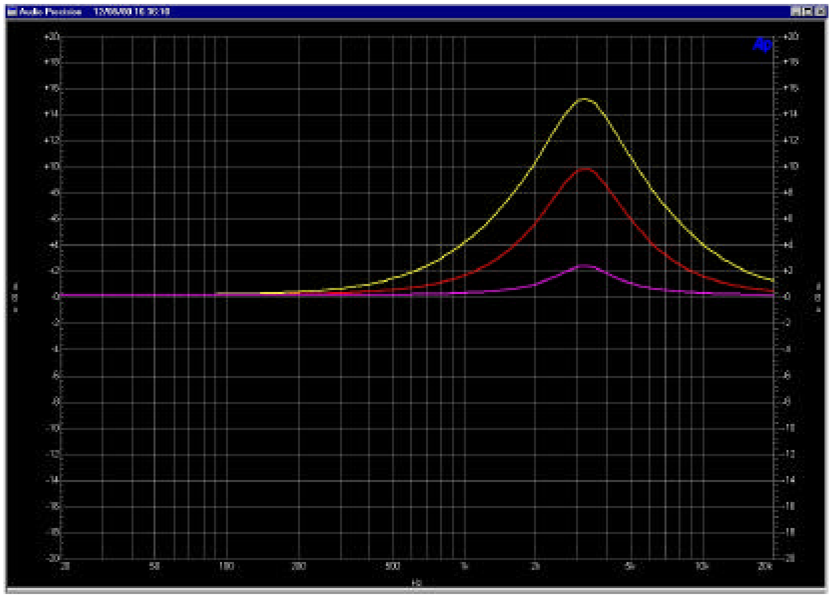
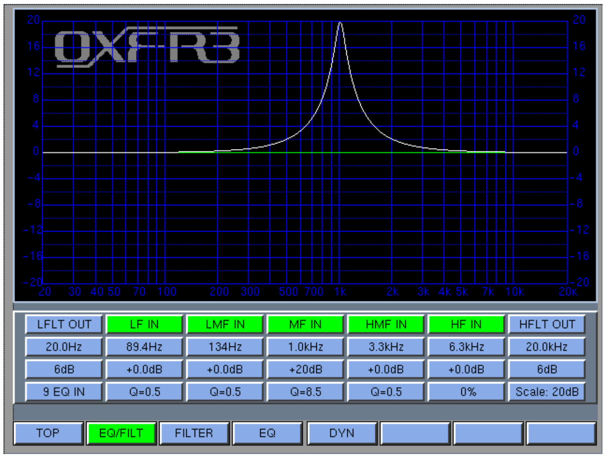
Bandpass sections.

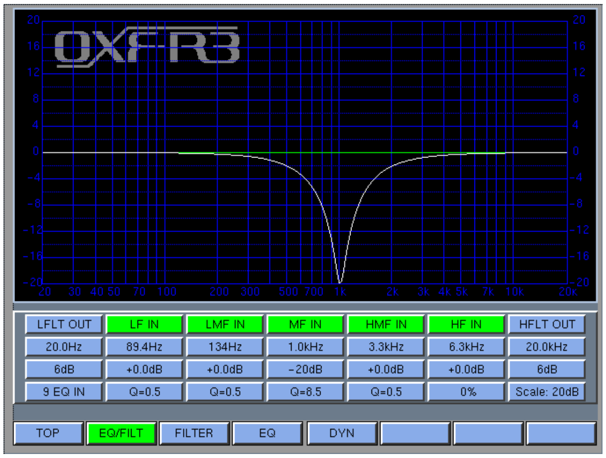
EQ type 1



EQ type 1 has minimal Gain / Q dependency, smaller amounts of boost or cut still have relatively high Q and it is therefore precise and well defined in use. The EQ lends itself well to percussion uses and resonance modification on drums, since relatively high Q is available at low gain settings. However it is sometimes difficult to obtain overall EQ fill on combined sources or subtle EQ on vocals, as the user needs to adjust the Q control to maintain an effect when the gain is changed. Failure to understand this fact has often added to the reputation of this type of EQ for sounding ‘hard’ or ‘harsh’. However, because the user retains separate control of all its parameters, this EQ is still the most flexible for users that have the time and patience to spend when using it. It is most like the original 4000 series SSLs, and other ‘clinical’ styles of EQ that became popular in the 1980’s.

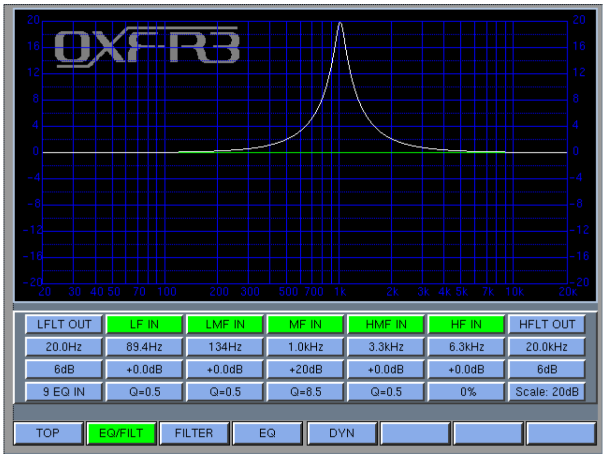


EQ Type 1 boost

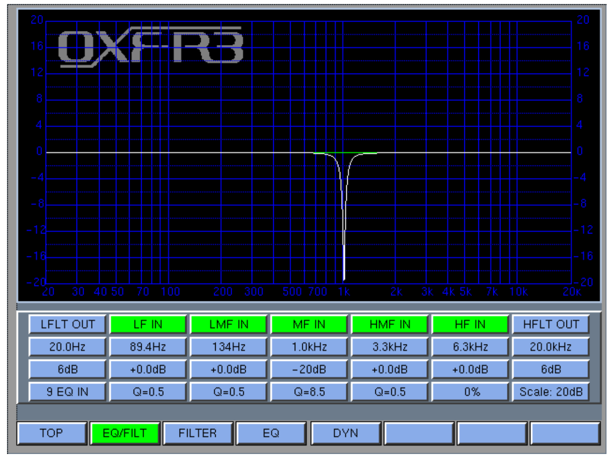


EQ Type 1 cut

EQ type 2



EQ type 2 with 20 dB of boost, Q is 8.5.

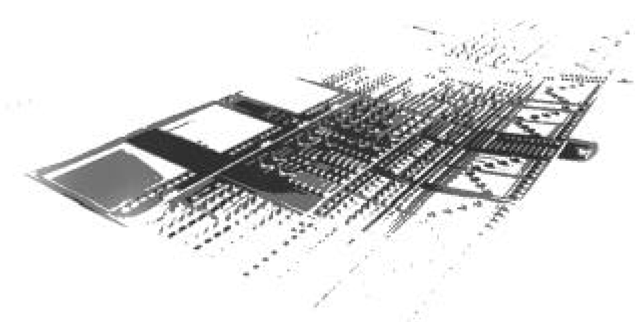


EQ type 2 with 20 dB of cut, Q is 8.5.

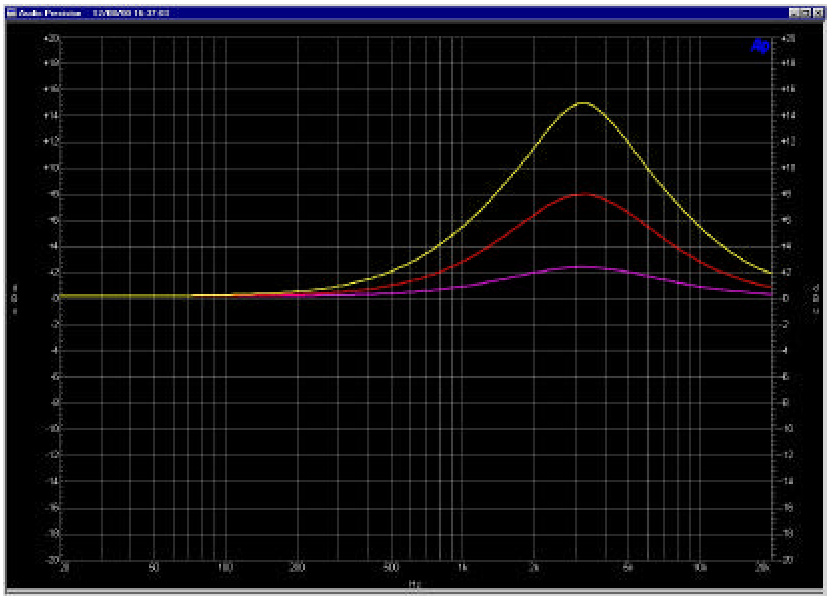
EQ type 2 is a true constant-Q design. It is identical to EQ type 1 when a signal is boosted. When the signal is cut the EQ response is sharper. This is ideal for notch filter applications.

This style is like some more obscure EQ such as the old Orbans etc.

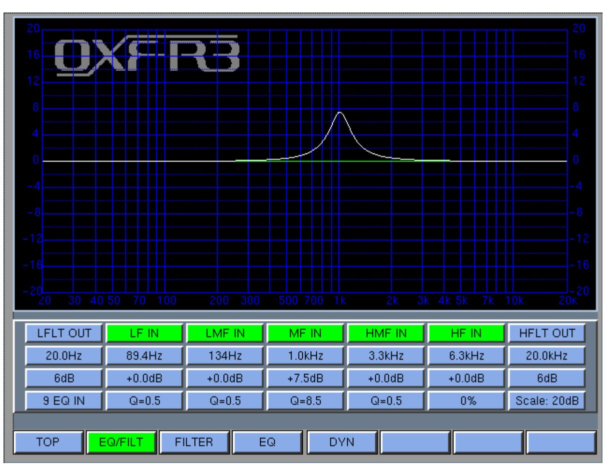
In the days of limited Q values (due to opamp noise), this EQ was useful because it produced a sharper cut (good for removing hum and percussive resonances) without high Q and noise in boost. So could be applied to a fairly wide range of applications without too many limitations.



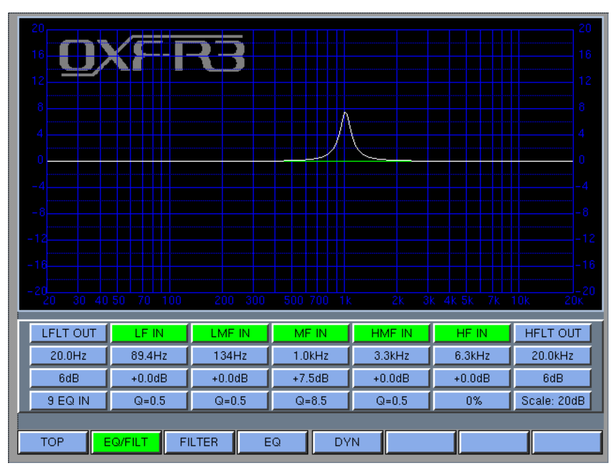
EQ type 3



EQ type 3 has a moderate amount of Gain / Q dependency whereby the Q reduces with gain. This provides the EQ with a softer characteristic as EQ is progressively applied. Since the effective bandwidth is increased for low gain settings, it sounds louder and more impressive when used at moderate settings. The gentler Q curve also lends itself better to overall EQ fills and more subtle corrections in instrument and vocal sources. Turning the Gain control seems to produce the effect that the ear is expecting without needing to adjust the Q control too often. Therefore EQs of this type are often dubbed as ‘more musical sounding’.
This EQ most resembles the older and well-loved Neve types, their modern derivatives and later SSL G series. Also many of the more popular outboard EQs have this dependency to some extent.

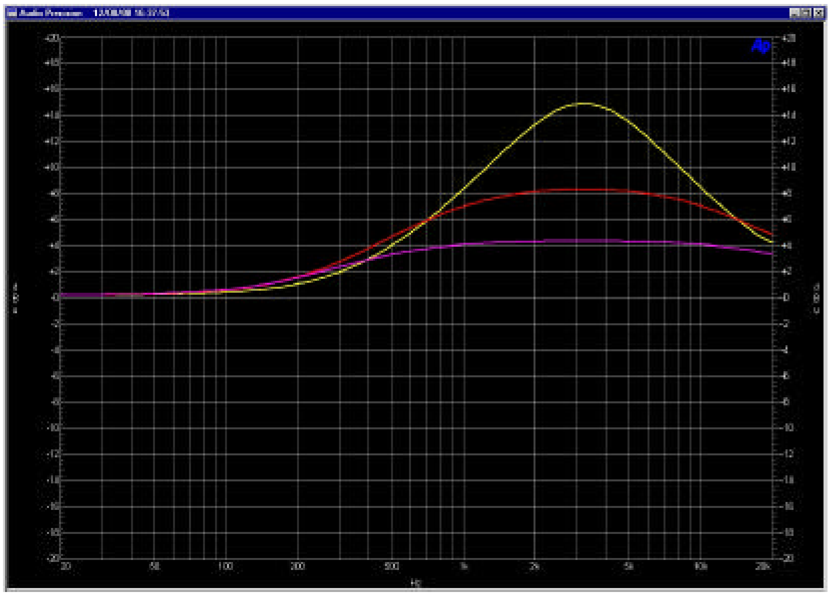


EQ type 3 with 7.5dB of boost and a Q of 8.5

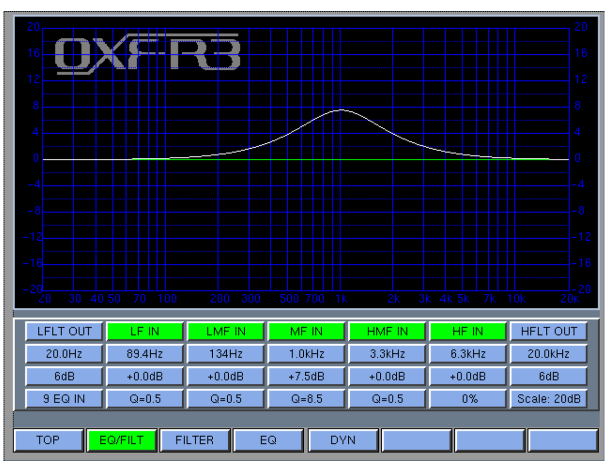


EQ type 1 with 7.5 dB of boost and a Q of 8.5

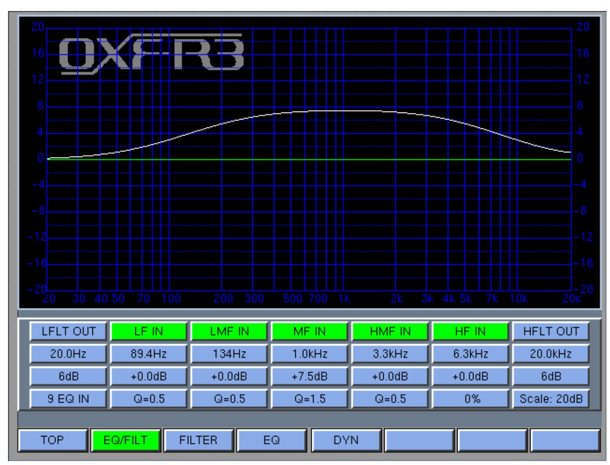
EQ type 4



EQ type 4 builds on the type 3, using a far greater Gain / Q dependency. This maintains an almost equal area under the curve in the boosted region with gain control operation. It is extremely soft and gentle in use and is most suited to overall EQ fill and character modification for mixed parts (and completed mixes) where subtle changes in overall impressions are required. Therefore it will also prove useful in mastering situations where there is requirement to match the sounds of tracks from different sources on a common production release.



EQ type 4 with a Q of 8.5



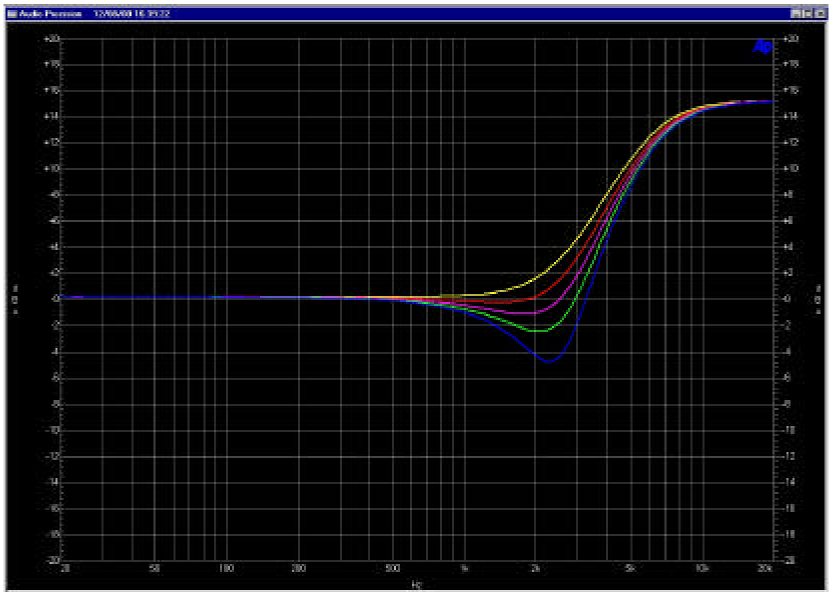
EQ type 4 with a Q of 1.5

Shelving sections.

In the Oxford EQ, the highest and lowest bandpass sections can be independently switched to shelving functions. Although shelving functions are often considered elementary, they are by no means all the same and their importance to the sound engineer should not be underestimated. Various types in common use are considered to favor certain types of use or are considered preferable by users of differing taste.

Our analysis of common shelving EQs has shown that one of the most important differences in the sound of the shelving EQ is the response around the band immediately below the HF section (and above the LF section). Many of the most loved classical EQs have a degree of 'overshoot' in this region (when in boost), either by design or as a result of circuit limitations in legacy units. Therefore most units can be characterized by control within this region of the frequency response. In appreciation of the importance of this parameter, the Oxford EQ provides the facility to modify the response in this region to provide differing styles of shelving EQ.

Shelving overshoot control



When the HF shelving function is selected, the Q control provides control of the 'overshoot' function.

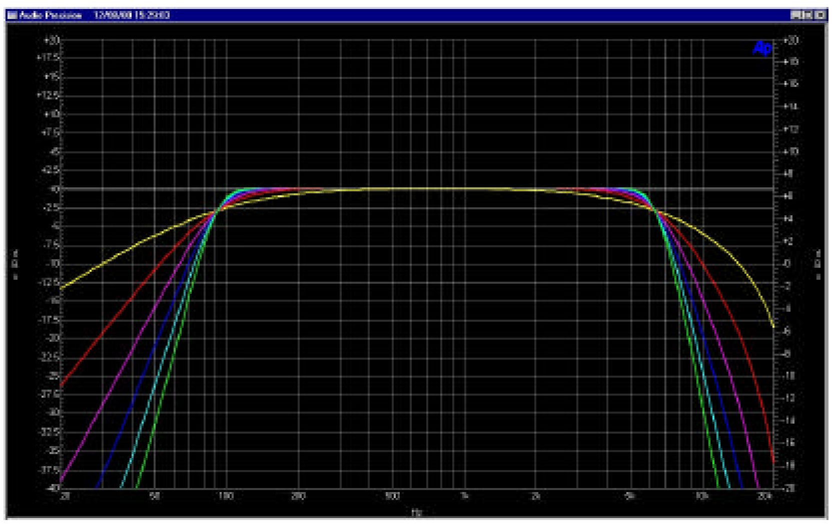
With the Q control set to minimum (yellow plot) the section has no overshoot and performs a basic and accurate shelving function. This is most like the responses provided by the original SSL 4000 EQs and many other outboard units often described as 'clean' EQs. Although these are still very popular units, some engineers complain that they can sound harsh and overbearing in comparison with legacy EQs.

As the Q control is increased the overshoot factor is also increased. For instance the red plot shows the slight dip in the response at around 1.5KHz for a boosted HF setting of 6KHz. This has the effect of suppressing the perceived mid range boost that occurs with the previous 'clean' variety, reducing the apparent 'hardness' of the sound. This, along with the increased slope rate, provides more apparent definition to the EQ in the band of interest.

The purple plot shows the effect of the Q control in mid position. This produces a gain loss of around 10% (of the boost gain) in the overshoot region and further defines the effect described above. This setting provides a response most like the legacy Neve designs and their derivatives and the later SSL G series EQs. This response produces an optimum effect by providing what the ear expects to hear as the gain control is operated and can explain the enduring popularity and renowned musical qualities attributed to EQs of this type.

At maximum (blue plot), the Q control provides for an overshoot of half the total boosted gain, i.e. for +20dB total HF boost the maximum loss in the overshoot region will be –10dB. The curves are symmetrical in cut and boost gain settings.

High and Low Pass Filters



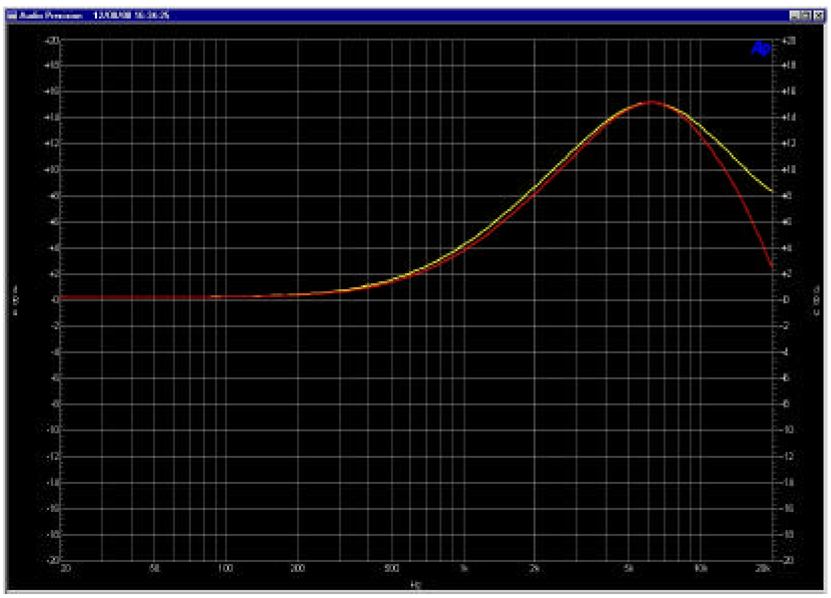
Every channel also includes a high pass and low pass filter. The cut-off frequency is continuously variable and the filter slope can be selected between 6 dB/octave and 36 dB/octave in 6 dB steps. Like all other controls throughout the EQ, the filter can be controlled by the console automation. Dynamic automation of the EQ and filters provides new creative tools for the studio. For example, the operator can 'de-ess' a vocal by dynamically automating the high frequency band against time code.

Noise and distortion in EQ.

Historically all EQ has suffered from excess noise which has often restricted its use. Analog circuits add noise due to transistor (and OPAMP) noise, thermal and impedance noise and distortion due to linearity issues. Digital EQ also has mechanisms for adding excess noise and distortion, but although these are similar in concept to analog noise there are important differences. A digital EQ implementation has the equivalent of finite mathematical precision that sets the performance limit of the EQ, which is heavily dependent on settings such as center Frequency, gain and Q factor. Depending on the specific design of a digital EQ, precision limit errors may appear as noise, harmonic distortion and even idling tones, which are both interrelated and program dependent.

There are many ways in which errors can crop up in digital EQ and there has been much research and publication of the subject. Many different EQ architectures (algorithms) have been proposed to optimize the situation and they all have advantages and disadvantages depending on the type of EQ and processor intended. In all cases these different algorithms are compromises that trade-off one undesirable effect against another. But with careful design, using appropriate processing and coefficient generation methods, a digital EQ can produce far greater sonic accuracy and measured performance than an analog design, because being an entirely numerical system it is not dependent on the limitations of imperfect analog components.

High frequency response cramping.



Another issue that has differentiated the sound of digital EQs from their analogue counterparts is HF response cramping. This phenomenon occurs when EQ curves approach the HF area closest to the half sampling frequency (Nyquist frequency) and manifests itself as an increase in the steepness of the EQ curve at the upper most part of the response. The plot shows a comparison between a cramped EQ (red plot) against a conventional EQ (actually a plot of the de-cramped Oxford EQ).

The effect of the cramping is to reduce the HF content of the EQ curve, restricting the openness of the sound and adding to the effect of harshness due to the predominance of mid frequency action within the unbalanced EQ curve.

By employing novel coefficient generation techniques, the Oxford EQ produces a fully de-cramped and symmetrical EQ response without resorting to inefficient or error prone over sampling techniques. In fact the method also allows the EQ to simulate the responses of an analog EQ with the center frequencies above the Nyquist frequency (i.e. 26KHz for the GML option), all at normal base band sampling rates without any change to the performance of the rest of the system.