Aphex Remote Controlled Microphone Preamplifier Model 1788

Specifications

Frequency Response	+ - .2 dB 10 Hz- 20KHz
EIN	123 dBu
Maximum Input	26 dBu
Maximum Output	24 dBu
THD+N	.003% @ 4 dBv Out
SMPTE	IMD < .02%
DIM	0.01%
Input CMMR	99dB @ 1kHz, - 72 dB @ 10 kHz
Dynamic Range	110 dB
S/N	85 dB
Crosstalk	96 dB

The Aphex Remote Controlled Microphone Preamplifier

Why locate the microphone preamplifiers near the microphone?

The audio industry has accepted for years the necessity of running microphone lines from the microphone back to the mix position where the mic levels are amplified to line levels. The advantages of digital and fiber technology for transmission of audio has created a demand for the amplification of the mic levels closer to the microphone. While a fixed gain stage may work for many applications, anyone who has mixed a live show or has done a tracking session, knows that there will inevitably be adjustments made to the mic preamps. Absent an engineer riding gain at the preamps, remote control becomes a necessity.

Beyond the necessity for remote controlled mic preamps, there are several sonic and operational advantages to locating the preamp near the microphone. The performance of microphones, dynamics in particular, is affected by impedance loads. The load impedance of the cable is a direct function of its length. Not only are the microphones affected, but the mic preamps at the end of the cable run are affected by the source impedance. It is also quite common to see mic splitters. While these provide galvanic isolation, they add even more to the impedance affects. The most common effects of the impedance loading on microphones are the frequency dependent losses, most noticeable on high frequencies and transient response. Limiting the length of the cable run as much as possible reduces these effects.

Phantom power on a mic line causes the line itself to become a microphone. Jiggling the line will create audible affects. Having the phantom power source as close as possible to the microphone also reduces the chance of phantom voltage loss within a very long cable run.

Most modern preamplifiers have excellent common mode rejection ratio, often approaching 110dB. If there is common mode signal (noise) built up in cable run and the gain of the preamp is 60dB, the residual common mode noise is only 50dB down. While common mode signal can be present in a short line as well as a long line, there is a higher probability that there will be more common mode signal in the longer line, especially if that line is crossing power and lighting cables and a high RF field.

Once remote control over the preamps is achieved, the ability to create and save presets is created. Every function in modern consoles, except for the mic preamps, can be automated. With the remote control of the preamps, scene changes can be done easily and seamlessly. With the appropriate software, the mic preamps can even 'learn' its gain settings, which can be then saved and recalled. Remote control also allows for group control over any number of preamps. By having the remote preamps feed a fiber system, the cost and weight of a multipair snake are eliminated.

Model 1788 Advantages

Continuously variable gain
There are several remote controlled preamps on the market. The problem is that they have stepped gain control and the step size may be as much as 10dB. Even a 3dB step, up or down, in a mic preamp will cause an audible click or pop when it is switched in. If there is enough gain in the system, the click could be an explosion! The Aphex Model 1788 overcomes this problem by a novel use (patent pending) of audio DACs. This method makes the step size very small (less than (((dB) and eliminates the artifacts of the DAC changing gain quickly.

Size
The Model 1788 contains eight preamps in 2RU space. Since there is a fair amount of heat dissipation, there should be at least 1RU spacing between every preamp. In that configuration, they may be stacked to provide 40 channels of high quality preamps in a standard 16RU road case.

Controllability
Other remote controlled mic preamps require a dedicated controller head. The Model 1788 may be controlled by either MIDI, RS-232 or RS-422. The control protocol is MIDI so that anything producing MIDI can act as the controller, such as a light controller board, a show control system, a sequencer, a DAW, a MIDI controller, a keyboard or a computer using Model 1788 control software. Up to 16 units (128 channels) can be controlled by one control line. The Model 1788 has an RS-422 output which can be used to daisy chain units. Of course, all mic preamp functions can be controlled on the units as well.

The control software has a screen which displays all parameters and metering of one unit at a time and up to 16 units may be called up. All channel status information and metering are displayed in real time. A channel can be selected and settings modified. Scenes can be saved, modified and recalled in the control software. The software also contains a 'learn' function in which the channel(s) adjust the preamp gain to a definable peak value based on the input level during the 'learn' time.

Microphone Output Limiter
All preamps have a maximum input level. Once that level is exceeded, there is no way to remove that very unpleasant distortion. In order to avoid that occurrence, many engineers set the preamp so that the expected peak level at maximum sound level is still at least 12dB below the clip point. While this provides some insurance against the preamp clipping, it causes a loss of noise performance and, in the case of digital, a loss of resolution. The Model 1788 has a unique limiter (patent pending) in the front end of the preamp which limits the output level of the microphone by as much as 20dB, hence the name 'Microphone Output Limiter'. This allows the engineer to get maximum noise performance and also allows maximum resolution for an analog to digital converter, all without worrying about crashing the preamp.

26dB Pad
The Model 1788 has 39dB of adjustable input gain and fixed gain of 26dB for a total maximum gain of 65dB. There is a 26dB pad which will allow a preamp to be run as a unity gain buffer stage. For example, this allows the line level output of a wireless mic receiver to be fed into the preamp

Adjustable maximum output level
The maximum output level of the Model 1788 is +24dBm (loaded into 600 Ohms) balanced. There are, however, many input stages which have odd maximum input levels (e.g.-+18dBu). In order to retain the function of the microphone limiter and maximize noise performance of the entire audio system, the Model 1788 has output level trim of up to 24dB. Once the maximum input level of the device following the Model 1788 is defined, the output level of the 1788 can be trimmed to that exact level. The input gain of the 1788 is then adjusted to achieve optimum performance. In addition to the 24db of output adjustment, each output may be muted.

Separate analog outputs
As mentioned above, microphones are often passively split and then fed to two or more locations. The Model 1788 has two separately trimmable, buffered analog outputs. The main output on XLR is transformerless servo-balanced and the second output is tranformerless balanced on a DB25 multipin connector. This allows two separate inputs to be fed at optimal levels from an optimized mic preamp.

Digital option
In addition to the analog outputs, the Model 1788 has three optional digital outputs. The analog to digital converters are 24 bit with selectable sampling rates. The sampling rates can be generated from an internal clock or an external source. The Model 1788 employs a drift stabilized A/D converter circuit (patent pending) which eliminates DC from the output without incorporating a digital high pass filter. The digital outputs appear on two DB25 connectors, one for AES/EBU and one for the T/DIF format. There is also a TOSLINK optical output for the ADAT format. There is an AES/EBU input on an XLR and a Word Clock on a BNC connector for external clock input. If the unit is being used as a master there is an AES/EBU output on an XLR.

Test Tone Generator
There is a 700Hz test tone at two different levels which can be bussed to any selected preamp channel. The two levels are at 0dBfs (maximum output level) and -20dBfs. The test tone at 0dBfs allows easy set up for finding maximum peak input into following stages. The -20dBfs tone is useful for digital systems which use a -20dB reference tone for '0Vu'.

Display
The Model 1788 has LED indicators for the status of each function for each channel. A twelve segment LED meter displays headroom. Two eight segment LED's show input gain or maximum output level on either of the two analog outputs. All indicators and metering can be monitored at the remote location.

Headphone output
As an additional feature, the Model 1788 has a front panel headphone output. Any channel can be selected and the output level adjusted.

Audio Quality
A final word about audio quality. Aphex has traditionally avoided the use of audio transformers. In order to achieve all the functionality of the mic preamp the only choice was to use an input transformer. After testing and listening to a number of transformers, we chose a Jensen for the best combination of performance and size. The rest of the circuitry was also designed for stability and excellent audio performance. The Model 1788 is built with the highest quality components to achieve wide bandwidth, low noise and low distortion. The combination of a high quality microphone preamplifier with the elimination of long cable runs at mic level and mic splitters will provide a tremendous boost in audio quality.