

Piece for Sixteen Amplifiers

John Richards 2004

Piece for Sixteen Amplifiers

John Richards 2004

Piece for Sixteen Amplifiers uses the idea of a 'no-input' feedback loop. The no-input refers to a 'sealed' electronic feedback loop: there are no sounds from the outside acoustic sound world. A simple example of a no-input feedback loop can be created by taking the output from a channel of a mixing desk and plugging it back into the same channel's input. Essentially the pre-amplifier stage of the channel is forced into oscillation. A crude oscillator is created.

The piece has been conceived as an improvised composition for a large live electronic group. The exact number of amplifiers and their looping (see below) is open to interpretation. The piece takes its title from the size of the group initially intended to perform the piece.

Set-up

Any amplifier may be used that has an input, output and volume control. A cheap and readily available option for the piece is a hi-fi amplifier. The examples and set-up information that follow are based on a stereo integrated hi-fi amplifier.

An integrated amplifier is made-up of two parts: pre-amplifier and power amplifier. The pre-amplifier stage enables different input sources to be selected along with a control for gain (volume control). Many pre-amplifiers also have equalisation. The type of equalisation used in most hi-fi amplifiers is a fixed shelf parametric. Typical tone control responses are: +/- 8 dB at 100 Hz (bass control), and +/- 8 dB at 10 kHz (treble control). The output from the pre-amplifier is then passed to power amplifier where the signal is amplified and sent to the loudspeakers. Most hi-fi amplifiers are stereo. Stereo amplifiers are essentially two amplifiers with a power amplification stage for each right and left channels. A balance control may also be found in the pre-amplifier stage to mix between (balance) the two channels. In addition to the two stages of a hi-fi amplifier, an ancillary headphone amp (low wattage amplification of the signal from the pre-amplifier) may be found.

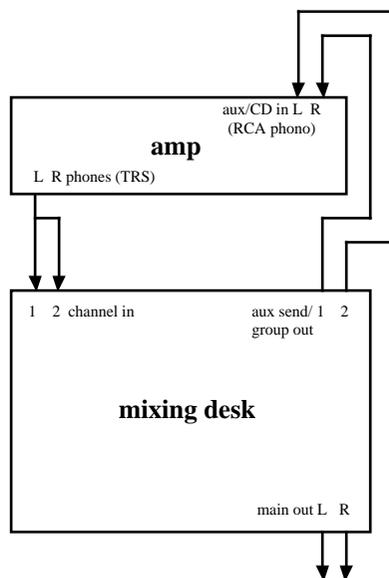
There are a number of different inputs on a hi-fi amplifier: for example, aux, CD, tuner etc. The connection for these inputs are RCA phono plugs. There are separate inputs for the right (red) and left (black/grey/white) channels.

The headphone output may be utilised for the purpose of a feedback loop. The connection is most commonly a quarter inch stereo jack: Tip-Ring-Sleeve (TRS) Tip = right, Ring = left, Sleeve = ground/earth.

The Loop

To create a no-input feedback loop using a hi-fi amplifier the headphone out (stereo quarter inch jack (TRS)) will be connected to, for example, the aux in (2 RCA phone plugs). However, to hear the feedback the loop needs to be 'tapped' and sent to a separate playback system (PA, mixing desk etc.) (see Diagram 1).

Diagram 1



To tap the loop, take the TRS headphone output from the amplifier and plug the right and left outputs into channels 1 and 2 of a mixing desk. The connection cable will be a 'Y' cable (stereo quarter inch jack to 2 mono quarter inch jacks). To send the signal back to the amplifier use either the auxiliary sends or the group outputs from the mixing desk. The connection cable will be 2 mono quarter inch jacks to 2 RCA phone plugs. Note! The settings for each channel along with the auxiliary (or group) sends will also influence the feedback loop.

'Playing' an Amplifier

The response of an amplifier depends on the loop configuration used for the piece (see Loop Configurations below), although each control on a hi-fi amplifier will alter the feedback in a generic way.

Below is a summary of the controls most commonly found on a hi-fi amplifier and how they can be used for shaping feedback.

Volume/Gain: The volume control is the most significant control for shaping feedback. Very subtle variations of gain will make the pre-amplifier stage of the hi-fi amplifier oscillate in a number of different ways. Changes in the feedback's timbre, pitch, and modulation can be created through the volume control alone.

Bass/Treble: When equalisation is used in the context of a feedback loop, it can be considered as a filter to the circuit that is oscillating. Consequently, by altering the treble or bass, the feedback can be made to change pitch.

Balance: The balance control is a subtle way of varying the volume/gain of each channel in a stereo amplifier. This works in conjunction with the main volume control and has the general effect of gained related responses.

Input selector: By switching to another unused input source, the loop can muted.

Loudness selector (some amplifiers): The loudness selector on an amplifier is essentially a pre-set equalisation setting. Typical responses of loudness are: + 6 dB at 100 Hz, + 6 dB at 10 kHz. The on/off options of the loudness gives two different filter settings. This, for example, may be used as a key to shift between different pitches.

The above description of playing an amplifier also applies to non-hi-fi amplifiers with similar controls.

Loop Configurations

Note

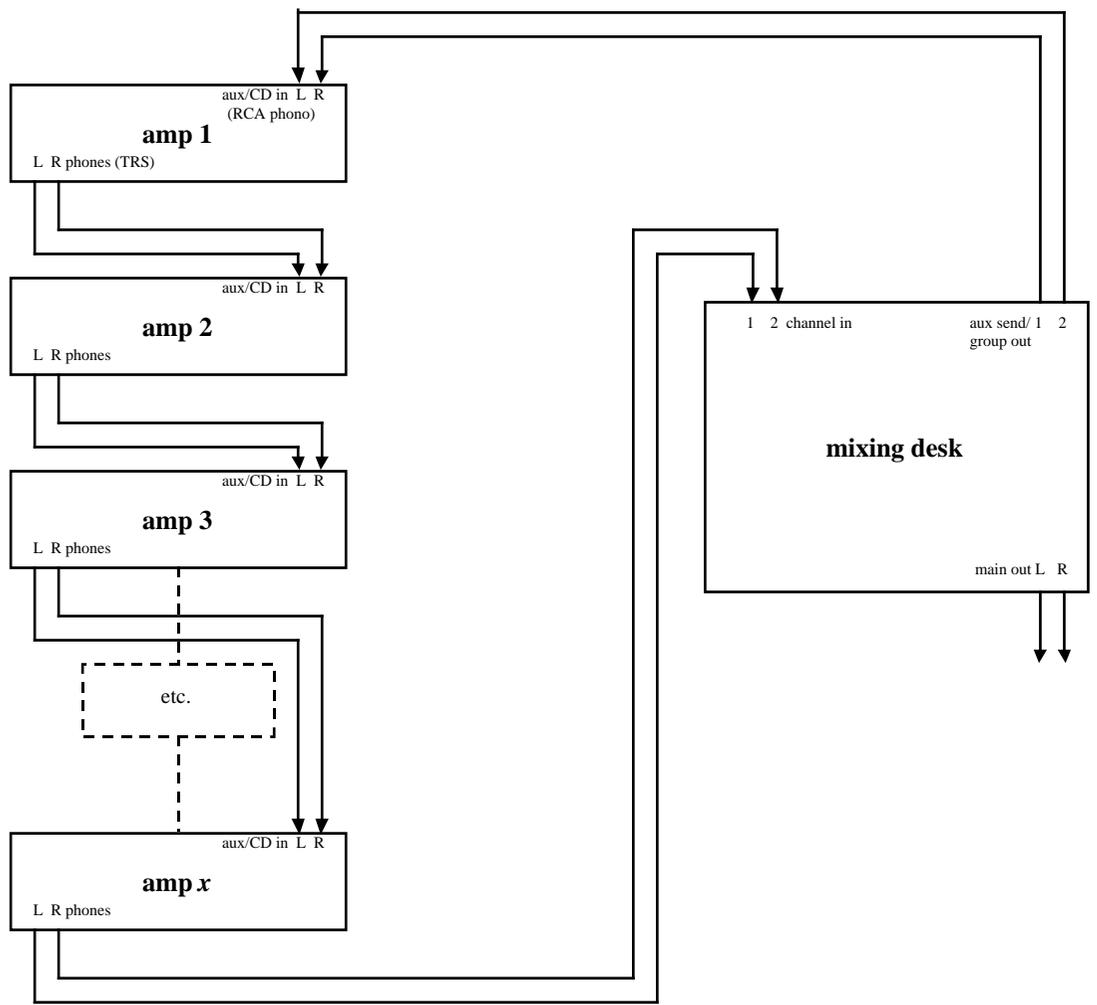
In *Piece for Sixteen Amplifiers* there are a large number of probabilities regarding feedback loop configurations. The amplifiers can be looped in series or in parallel; or, in a combination of these two. An example of configurations in series and in parallel follow.

The looping configuration will fundamentally influence the group performance. By looping the amplifiers in series, the group will perform as one discrete unit: the feedback will be a multiplication of all of the amplifiers. For example, if a performer increases the gain of 'amp 1', the amount of gain of all of the amplifiers will increase. Furthermore, if, for example, 'amp 5' is muted, the feedback loop will be broken: no sound will be generated by any amplifier. Essentially, when configured in series, the performers need to work as a single section. Note! When configured in series, careful attention needs to be paid to the overall gain level to avoid clipping.

The parallel configuration gives each performer a greater independence. Whereas looping the amplifiers in series produces 'one instrument' controlled by many performers, looping the amplifiers in parallel allows for multiple instruments, potentially each with a distinctive voice; however, the feedback from each amplifier needs to be tapped (sent to the mixing desk). For a large group, this increases the amount of cabling and the number of channel inputs and auxiliary sends or group outs in use on the mixing desk. One economical solution to utilising the number of available inputs and outputs of the mixing desk is to restrict stereo hi-fi amplifiers to one channel. This can be achieved by turning, for example, the balance control hard left and using the left input of the aux in: only one channel input and aux send/group out is needed on the mixing desk. Refer to the documentation of your mixing desk for its full range of inputs and outputs.

Part of the essence of the piece is for the performers to find their own loop configuration that works for the ensemble. For a large group, 'sub-loops', or a range of loops may be used to explore different performance techniques.

1. x amps in series



2. x amps in parallel

