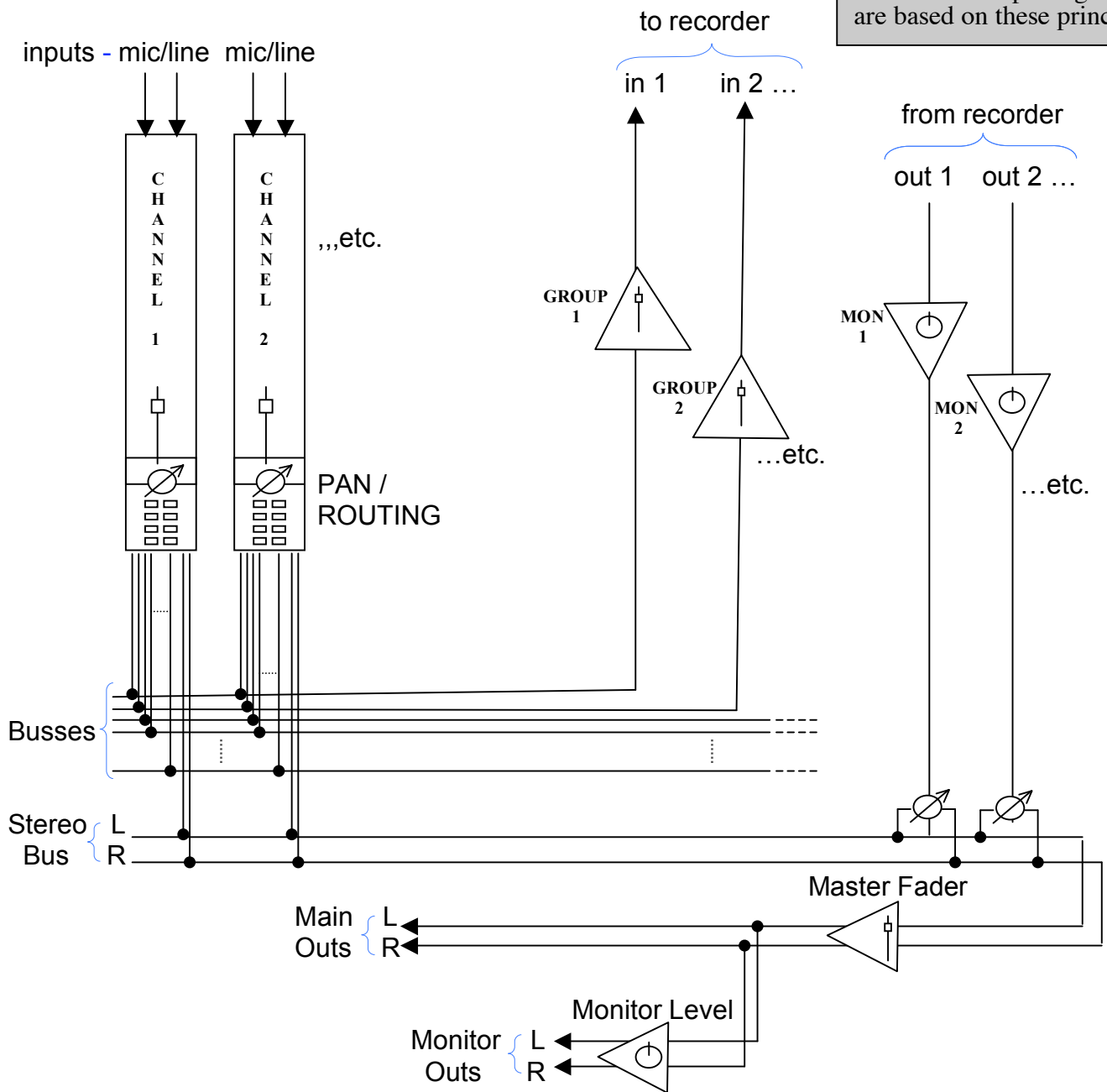


**MIXERS & MULTITRACK RECORDERS**

**Mixers : the signal flow through a typical hardware multitrack mixer**

Note software package mixers are based on these principles



Sound sources are invariably plugged into the **channel** inputs, mics into the mic inputs and line-level signals (synths, outboard gear, CD players, etc.) into the line inputs or via DI (direct injection) boxes to the mic in.

At the output of the channel the **routing** switches connect onto the desired **bus** which takes the signal to a specific destination, either to the multitrack recorder feeds (often via a bus or **group fader**) and/or the **main out** of the mixer (via the **master fader**). The **pan** control helps select between odd/even or left/right pairs of busses when necessary.

Monitor amps and speakers are fed from a dedicated **monitor out** stereo pair, so that the listening level from the mixer can be adjusted irrespective of the signal levels being handled.

**Monitor inputs** (sometimes called 'mix b' or 'tape returns') are provided on larger mixers to connect multitrack recorder outputs i.e. for monitoring tracks already recorded. These can alternatively be used as further line inputs (though the control facilities are usually more basic).

Smaller mixers may not have these at all but if they are used in studio with a computer workstation, the software's mixer will fulfil this role.

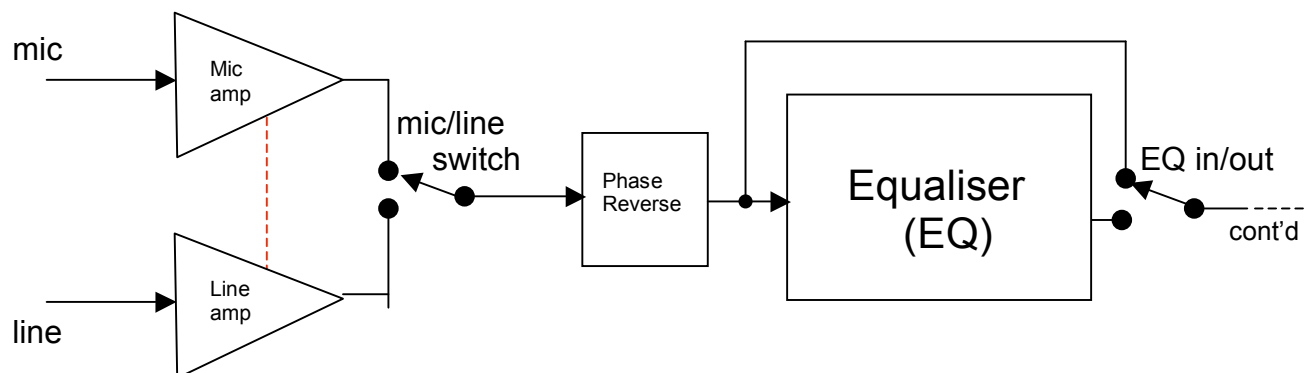
'In-Line' mixing desks (e.g. Mackie 8-bus, Beringher MX) place these types of inputs as a second signal path on the same channel strip, sharing the facilities such as EQ and auxiliary sends with the main mic/line input path.

Modern mixers often also have additional 'stereo channels', effectively two line-only channels and signal paths combined into one convenient strip on the mixer surface.

Some mention should also be made of **direct outs**, where channel's signals can be plugged or routed individually to a recorder's track input.

This facility is often offered as an alternative to the bus-routing system, but lacks the flexibility in that multiple channels cannot be mixed to a track and multiple tracks cannot be fed from a single channel.

## Mixers : A typical channel in detail



### The Mic Amp

Is a pre-amp providing a good 'balanced' connection and adequate amplification for most microphones (low level signals usually), allowing them to transfer their acquired signal waveforms as accurately as possible (this is the theory at least). 'Phantom power' (+48 volts) is a feature to feed necessary power to condenser mics (also see 'Mics & Techniques').

### The Line Amp

Provides minimal pre-amplification for signals that are already at or near 'line level', the normal operating level range within mixers. Two standards exist for line level: the professional +4 dB and semi-professional -10 dB.

Note that these two pre-amps are alternative inputs to the channel and their amplification gains are usually adjusted by the same control on the mixer surface.

The **mic/line switch** function can be operated by a dedicated switch or, on smaller mixers, by simply inserting a jack into the line input.

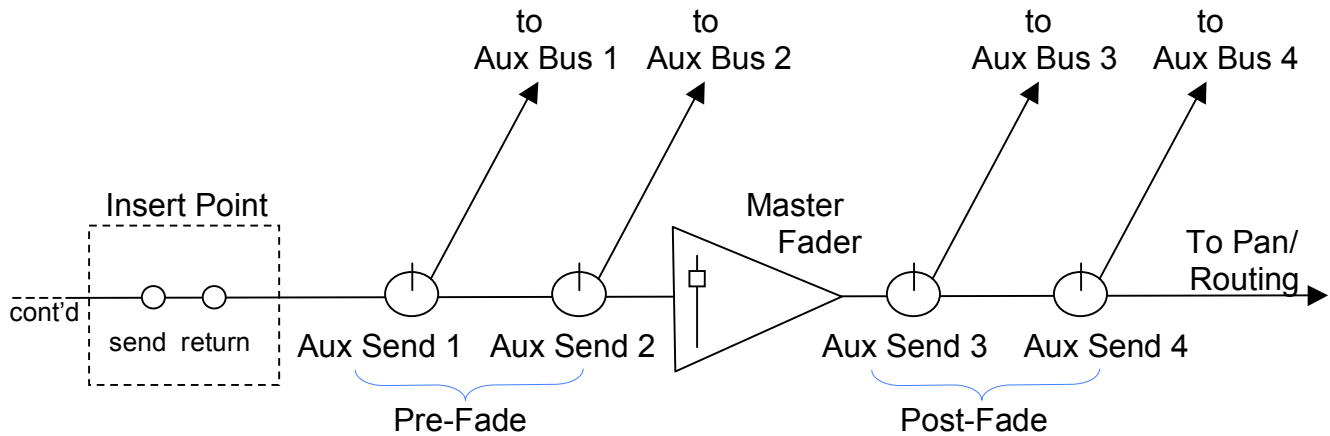
### Phase Reverse

Provided on the larger mixers to reverse the polarity of the channel's signal i.e. positive parts of the waveform are made the equivalent negative, and vice versa.

The symbol  $\emptyset$  often denotes this.

### The Equaliser (EQ)

Allows alteration of the channel signal's frequency content (see 'Equalisation').



### The Insert Point

Gives provision to connect an external device (e.g. compressor or gate) into the channel path.

Either by using a special 'insert cable' (a TRS jack to two separate in and out jacks) or a patchbay (more later); a **send** can be connected to an outboard device's input, then its output brought back to the channel into the **return**. In doing this, the 'normalised' connection between the send and return is broken allowing the effective insertion of the device into the channel. Note this point may be before the EQ on some mixers, or switchable.

### Auxiliary Sends

'Aux sends' allow a variable amount of the channel signal to be sent via further auxiliary busses (meaning that other channel's signals can be picked up too) to desired destinations.

The **post-fade** sends (i.e. after the fader) are usually used to send to effect units such as delays or reverbs, the **pre-fade** sends (i.e. before the fader) usually for 'foldback' (sending alternative mixes of the mixer's channel signals to musician's headphones).

### The Channel Fader

Provides accurate control of the channel signal level before it's mixed with other signals and/or recorded.

### Mute and Solo

The **mute** function allows instantaneous shutting off of a channels signal without having to lose a fader setting.

There are two main types of **solo**:

- **prefade listen (PFL)**, taps the channel signal before the fader and sends it to the mixer monitor outputs . This is used primarily for signal presence or level checking.
- **'In Place' solo**, is effectively the same as muting all other channels i.e. the signal is monitored after the fader and pan-pot. This can be useful in mixing situations to check single or multiple channels as they occur within the mix balance.

## **Multitrack Recorders**

Multitrack means that signals can be recorded in a number of independent locations but are also playable as a group in repeatable synchronisation.

Some years ago the most popular multitrack recorder was an analogue tape machine, where the wide tape was divided into parallel unique tracks (commercial industry standard evolved to 2-inch tape giving 24 tracks but other formats have also been used).

Today the hard-disk recorder predominates using computer technology to provide the storage, either as a dedicated unit or running on a computer platform often alongside MIDI sequencing (e.g. ProTools, Logic, Cubase, etc.).

The big advantage of hard-disk is that the tracks are not physically fixed in time (referred to as being 'non-linear') but audio can be freely moved or copied in time relative to other tracks or onto other tracks without degradation.

Necessary professional features:

- metering of each individual track
- record enable buttons for each track
- transport controls (stop, play record, rewind, forward wind, pause, locators, cycling, ...)
- 'input monitor' capability (including 'auto input' facility)
- editing possibilities.