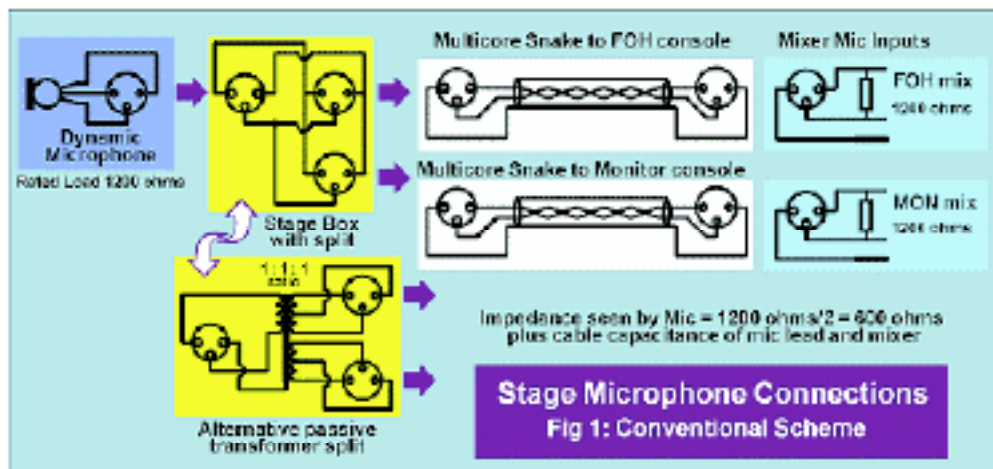


## Dynamic Microphone Behaviour

Everyday dynamic microphones are broadly assumed to have an impedance around 250 ohms. In reality, the impedance of many widely used microphones fluctuates widely at resonant points across their frequency range, up to 2500 ohms (over 10 times higher) and down to 50 ohms, or one fifth of the nominal. These impedance fluctuations aren't a problem when microphones are plugged into a single mixer, presenting a load that's close to the 1200 ohms specified for most microphones.

The trouble starts when more than one mixer needs to be connected across each microphone. As soon as a monitoring console is added across the F.O.H. mixer, microphone loading drops to 600 ohms (fig.1). When additional mixers are added for recording and/or broadcasting, the loading falls further, down to 300 ohms when 4 mixers' inputs are connected. The load impedance seen by microphones is often even lower at high frequencies above 5kHz, due to the capacitance of many metres of multicore cable, and also the RF filtering capacitors inside each console



## How excess loading affects Microphones

The extra loading of multiple mixers has two effects:

**First**, it reduces the microphone's output level by between 3 and 6dB. This isn't much of a problem by itself, but if any of the mixers is for some reason unplugged or switched from **Microphone** (1200 ohms input impedance) to **Line** (10k bridging impedance), this sudden change in microphone level can trigger feedback in the PA system, requiring some frenzied adjustments.

**Second**, and more important perhaps, the microphone's frequency response is changed. At the microphone's resonant points, the response (with loads below the rated 1200 ohms) may dip or peak by several extra dB, causing a substantial change in the way the microphone sounds. This upsets the engineer's judgement as to which microphone to use, and requires extra EQ'ing effort in an attempt to recover the intended sonic characteristics.

Because the response changes can involve changes in quite sharp dips and peaks, not many console EQ sections will be capable of fully or satisfactorily compensating the results of the microphone's excess loading. Again, if the **Microphone/Line** settings of any of the 2,3 or 4 mixers across the microphone are subsequently changed, the frequency response will be upset, possibly causing howlround, and certainly causing the

microphone's sound to change again, requiring further EQ'ing. Even without Microphone/Line switching, level and tonal changes can occur when pad switches are operated, as in some consoles their setting significantly alters the input load impedance.

Overall, as the PA crew have little control over what broadcasting and recording engineers do with the consoles in their trucks, this explains why broadcast and recording link-ups are regarded with some trepidation...!

### Why Microphone Splitter Transformers don't help

Microphone **splitter** transformers are commonly employed when microphones are connected to more than one or two mixers. They usually have 1:1 ratios, eg. 1:1:1:1 for a three-way split. It's a common belief that they alleviate the mixers' loading effects. This however is wrong, unless the transformer is combined with active electronics.

Usually for reasons of cost, splitter transformers are stand-alone, passive devices. If so, they can only apportion the microphone's impedance equally between the mixers, exactly as would happen without the transformer! Splitter transformers are still useful, as they galvanically isolate the grounds breaking potential loops, and also restricting the potential for damage and death if any circuits are accidentally connected to the mains power. However, Ground isolation can be achieved more cheaply by breaking shield connections with switches, or using low value resistors for a **soft float**.

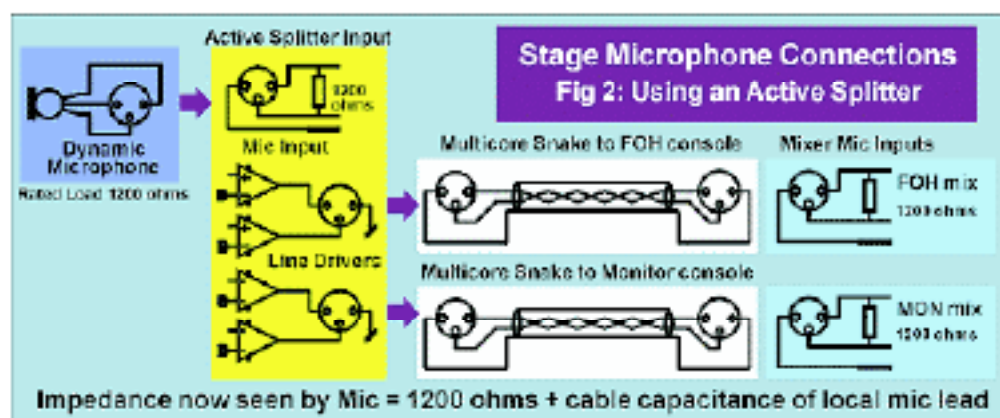
Since good transformers are highly expensive, and more affordable transformers will always add significant frequency response, phase and distortion aberrations of their own, it's really best to avoid them unless galvanic isolation is essential for safety, for example, in outdoor events where wet weather is possible, or where insurance requires it.

### Benefits of an Active Split

Because an Active Microphone Splitter makes each feed immune to changes caused by the loading presented by additional mixer connections, one of its psychological high notes is that harassed live sound engineers can quit worrying about the mobile truck !

Use of an Active Microphone Splitter close to the microphones also improves sound quality - on at least 3 counts:

First, each microphone's signal level is brought up to line level before it has travelled away from the stage, so the signal level rides 10-20dB higher above hum, RF hash and signal breakthrough that gets picked up along the main body of multicore cabling.



Meanwhile, the noise level (or S/N ratio) of the microphone splitter is as good as the best console microphone inputs.

Second, pickup in the multicore is typically reduced, particularly at RF, as the Active Microphone Splitter's output impedance is much lower (at 50 ohms) at all audio frequencies and up to 1 MHz and above, and is more consistent than any dynamic microphone.

Third, by avoiding the complex loading effects of multiple consoles, each microphone's frequency response and sonics are improved - back to what the maker intended - and less EQ'ing will be required.

### How the ARX MSX 32/MSX 8 fit into all this

The ARX MSX 32/MSX 8 microphone splitters contain high quality components in a carefully considered signal path. This provides Dynamic microphones with a constant, ideal 1200 ohm load, irrespective of

whether the pad switch is in or out.

And, unlike many consoles, the switchable Phantom power is applied in a way that prevents speaker and nerve destroying bangs and clicks.

Internally, powerful RF input filtering removes both common mode and differential interference at ultrasonic frequencies and above. High CMRR is achieved by the use of precision components throughout. Advanced user options include internally jumper linking Inputs to Main outputs, and Ground lifting Output Pins 1 as required.

### Signal Options

The original signal from the microphone is connected into the Input connector on the rear panel of the chosen channel. From there it can go any or all of four separate ways.

1. To the main Front of house console, out of the Main connector on the rear panel
2. To the Monitor console (or a second Main console) out of the Monitor connector on the rear panel
3. To either of the two front panel splits, for connection to remote trucks, OB vans, recording feeds, press feeds, etc.

In normally supplied configuration these two splits are electronically balanced, identical to the Main and Monitor feeds. However, all splits can be optionally fitted with isolating transformers where complete signal isolation is required.

Each channel has a -20 dB pad switch to cope with ultra hot signals and rear panel Gain DIP switches, plus silently switchable 48V Phantom power with indicator LED. A 'Listen/PFL' switch and LED PFL metering enables each channel to be easily checked with headphones for line tracing when setting up.

To avoid confusion the Listen switch is non-latching, so only one channel's signal at a time will be heard.

A 'Link' switch links each channel to the one immediately before it, on its Left, providing an ultimate maximum of 32 Outputs from a single input. An indicator LED shows when this is active. A Clip LED indicates imminent signal overload through the channel.

A numbered marker panel on the front provides a space where individual channel connections can be noted.

### Transformer Balancing

All four output splits have the option of transformer balancing where specified. These are fitted in as pairs - ie. a front panel pair and a rear panel pair.

Ideally these should be installed at the time of ordering the unit(s), but they are available as a retrofittable kit. Contact [ARX](#) directly or the dealer at your point of sale for further information on obtaining a transformer balancing kit. The kit has complete details on the installation, testing and ground lift wiring of the transformers.

**Note: Fitting balancing transformers will require removing the lid of the unit and physically handling the circuit board(s), and therefore a degree of technical knowledge is required for this retrofitting. Electrical Safety and Occupational Health and Safety regulations require that this work must only be undertaken by a qualified technician.**

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**IMPORTANT:** One final thing to check is that the AC Power at the wall is in the same voltage range as that printed on the fuse holder doors - 100 to 120V AC or 220-240 V AC, before plugging the MSX 32/MSX 8 into the AC supply.

If it is incorrect, disconnect the power lead from the unit, pull the fuseholder out and turn it 180 degrees before replacing it.