**Difference between public address system and professional audio system**

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Public broadcasting is a broadcast that serves the public within a limited (but rather large) range. In the conventional case, the public broadcast signal is transmitted through a broadcast line disposed in the broadcast service area, usually a one-way (downlink) cable broadcast.

Public broadcasting is usually set up in agencies, military units, businesses, schools, communities, buildings, supermarkets, and various venues for publishing news and internal information, posting work signals, providing background music, and for paging (Paging - such as broadcasting) Tracing people and forcibly inserting accidental accidents and other emergency broadcasts.

Public broadcasting is also useful for wireless transmission, but it is not mainstream.

1. The simplest public address system and its characteristics

A public address system must have at least the following links: broadcast speakers, broadcast amplifiers, and microphones.

Low-power broadcast power amplifiers below 100W usually have their own preamps, no need to configure preamplifiers, commonly known as combined broadcasters. Broadcast power amplifiers with large power (for example, hundreds of watts or more) usually have to be equipped with a broadcast preamplifier. However, whether it is a preamplifier in a combined broadcaster or a discrete broadcast preamplifier, its input should be prioritized. Usually at least one microphone is at the highest priority, and the signal of the microphone can automatically suppress other input signals (so-called automatic "sound" function), so that emergency broadcast can be forcibly inserted during paging and in case of emergency. This is also different from general HiFi (or professional) preamps and mixers.

The terminology in this system: microphones, lines, amplifiers, speakers, etc. are familiar to general electroacoustic workers or electro-acoustic audio enthusiasts. However, the broadcast lines, broadcast amplifiers, and broadcast speakers are slightly different from ordinary speaker cables, amplifiers, and speakers.

The key is that the broadcast line is usually quite long (several hundred meters or even more than a kilometer), while the speaker cable of a professional audio system rarely exceeds 100 meters. In order to reduce the transmission loss, the broadcast signal is transmitted in principle by "high voltage / small current". Therefore, the broadcast line generally does not need to use expensive speaker cables, but only ordinary twisted pairs; if it is installed outdoors, lightning protection equipment should be added.

Since the system is transmitted at high voltage, the broadcast power amplifier must provide a high voltage signal. Usually broadcast amplifiers have built-in output transformers to boost (or regulate) their output voltage, called "constant voltage" amplifiers. The output terminal of the constant voltage amplifier is marked with the nominal output voltage (NormalOutputVoltage) specifications such as 70V/100V/120V/200V, instead of the rated load impedance value (ohm-number) as the professional power amplifier. The latter is also known as the "fixed resistance" amplifier.

The broadcast speaker is the terminal of the broadcasting system. Since the broadcast line provides a "high voltage/small current" signal, accordingly, the broadcast speakers should be high impedance, and they all have built-in "line transformers" for impedance transformation. Its input terminal also indicates the nominal applicable voltage specification (and rated power value) such as 70V/100V/120V/200V, not its impedance value. It is not necessary to calculate the impedance of the broadcast speakers when they are mated, they can be hooked up only if their applicable voltage specifications match the nominal transmission voltage of the broadcast line, but the total number of broadcast speakers attached (parallel) on the same line The power cannot be greater than the rated output power of the broadcast power amplifier that drives the line. Otherwise the broadcast amplifier will be overloaded. The minimum number of broadcast speakers is not limited, and the broadcast amplifier will not deteriorate due to light load or no load, and will not be damaged.

The simple system shown in Figure 1 can only publish voice broadcasts, such as notifications, paging, speech, and so on. If you want to broadcast background music, broadcast news, and release recordings, you need to add CDs, decks, tuner (radio) and other equipment. Broadcast power amplifiers are usually equipped with multiple input interfaces with priority ordering, which can be easily connected to these devices.

By the way, some people think that the output voltage of a constant-voltage amplifier should be equal to its nominal voltage at any time. When they use a voltmeter (or level meter) to monitor a running constant-voltage amplifier, they always find the output under-voltage. I think the amplifier is faulty. This is actually a kind of misunderstanding. The "nominal output voltage" of a "constant pressure" broadcast power amplifier refers to the output voltage corresponding to the rated output, not the output voltage that is present under all circumstances. In fact, since the sound signal is a strong and weak signal, the actual output voltage of the audio power amplifier during normal operation is also changing at any time. Under no overload conditions, only the peak signal will reach the nominal value, and its average output will always be less than the nominal value. This is the reason for “always undervoltage” when monitoring with a level meter. The so-called "constant pressure type" means that its output voltage does not change with the weight of the load (under no overload conditions) - that is, it has the output characteristics of the voltage source, not that its output voltage is fixed like the power supply voltage. A magnitude. Most of the modern audio power amplifiers use the large loop voltage negative feedback technology. Therefore, even the so-called "fixed-resistance" power amplifiers are actually "constant pressure", but they are not labeled at the output end. The voltage value at the rated output, but the load impedance value corresponding to this.

In addition, the public address system is not a stereo system in principle. The stereo system is an electroacoustic system that can reproduce the orientation of the original sound source to a certain extent. As you know, in order to create a sound image with azimuthal properties, the stereo system requires at least two channels, that is, at least two speakers arranged according to certain rules are used to release two paths that are related and different. The public address system has only one channel in principle. Although there may be many speakers in the public address system, they only play the same sound; multiple speakers are not intended to create a sound image, but to create a sound field that is as uniform as possible in the broadcast service area. Of course, if it is necessary to broadcast stereo programs in the public address system, it is not impossible, but only in a limited broadcast area, and additional investment is required.

2. Interchange of public broadcasting equipment with professional audio equipment

Can I use a professional audio device to build a public address system or vice versa? The answer is yes, but not necessarily appropriate.

If you use a professional power amplifier instead of a broadcast power amplifier, you need to find ways to increase (or regulate) its output voltage. The methods are:

? Choose a professional amplifier or amplifier combination (bridge or series) with the appropriate rated output power to achieve a constant voltage output (usually 100V) compatible with the broadcast speaker.

? Match the appropriate output transformer at the output of the professional amplifier.

The output voltage of a professional amplifier has the following relationship with its rated output power (Po) and rated load resistance (Rz):

U=(Po·Rz)1/2

Accordingly, the 2500W/4Ω professional power amplifier has exactly 100V output voltage and can be used directly. However, the total power of the broadcast speaker should not exceed 2500W (only considering the load capacity of the amplifier, and does not consider the requirements of the relevant regulations); on the other hand, no matter how small the total power of the broadcast speaker is, it is not possible to use a power amplifier with a small power, otherwise the broadcast cannot be guaranteed. The transmission voltage that the line should have. An output voltage close to 100V can also be obtained by bridging two 650W/4Ω professional power amplifiers. Obviously, when the total power of the broadcast speakers is much less than 2500W, it is not cost-effective to use the above method. If you want to use a power amplifier that is equivalent to the total power of the broadcast speaker, calculate its output voltage according to the above formula, and then connect the appropriate output transformer. However, the connection of the output transformer to the professional power amplifier can easily lead to the damage of the power amplifier, and appropriate measures need to be taken (here omitted).

Professional speakers can also be used as broadcast speakers, but must be equipped with "line transformers". As mentioned above, the "line-to-line transformer" acts as an impedance converter, enabling a "fixed-resistance" professional speaker to draw power equivalent to its own rating in a "constant voltage" broadcast transmission line. Without the "line transformer", several professional speakers can be used in series and parallel, but they can be used cumbersomely. In the course of operation, as long as one of the speakers is damaged, the system may be subverted (all not Ring or burn other speakers or burn the amplifier).

It is barely feasible to use a mixer as a broadcast preamplifier. However, the mixer usually does not have a signal priority ordering, which is not convenient for the "forced insertion" function necessary for the broadcast system.

In turn, broadcast amplifiers and broadcast speakers can also be used in professional audio systems. But because they all have built-in output transformers or line-to-line transformers, their frequency response characteristics are far less than those of professional amplifiers. Broadcast preamplifiers are also reluctant to use in professional audio systems because they do not have the functions of grouping, equalization, effects, etc., and their prioritization functions are mostly redundant for professional audio systems.

Therefore, it is not feasible to exchange equipment for public address systems and professional sound systems, although it is feasible. It usually leads to a deterioration in the performance price ratio.

