DIFFERENCES IN TYPES OF AUDIO EQUIPMENT

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There are several types of audio equipment, with an emphasis on amplifiers, each with differing requirements for the intended market. These include:

Basic Consumer
Standard Consumer
Commercial Public Address
Commercial Music Distribution
Musical Effects
Professional for Sound Reinforcement and Musical Performance
Professional Recording
Audiophile

Characteristics are in no particular order. Requirements are generally given in order of engineering goals.

In more detail:

Basic Consumer

This includes low cost equipment used by the public for basic day to day listening to audio programming. There is some crossover with standard consumer products.

Characteristics:

1. This includes some pretty bad sounding products as well some which the public feel are quite good sounding.
2. Typical Brands - Mainly no name brands (including store brands) or former great brands that now are only a label. Names like RCA, Westinghouse and the like. Specifications are rarely mentioned.
3. Types of Product - cheap earbuds, small MP3 players, cheaper phones, unamplified computer speakers, lower cost TV sets. From the pretty well extinct basic transistor radio up to cheaper computer speakers and music players.
4. Where Sold - Places such as dollar stores up to discount department stores such as Wal Mart. Amazon.
5. Amplification – Tends to be either class AB or class D in ICs.
6. Disposable – Seldom ever repaired – Replaced when defective
7. Ease of Use – Very simplified – Few controls or settings.
8. Connections – 1/8” stereo mini plug mainly. Sometimes phono jacks.
9. Power - Often operated from battery power.

10. Operational life – Short. Generally superseded by newer products every year and replaced often by users. The technology moves pretty quickly.
11. Technology is generally digital these days. Generally plays MP3 files at 44.1K/16 bit
12. These bottom end products are a lot better than products in this range were in the 1990s and continue to improve.

Requirements include:

1. Safety
2. Compliant to regulatory requirements
3. Low cost – Generally made offshore to sell on low price.
4. Frequency response from 40Hz to 12kHz or so. Just enough to give an illusion of some bottom and top end.
5. Power - From a fraction of a watt to a few watts. Distortion levels rarely specified and interpretation of power rating may be very loose. That is, the actual power output may only be a fraction of what is mentioned on the package if mentioned at all. On personal music players the maximum power delivered to headphones may be regulated to specific maximum levels to prevent hearing damage with unskilled users.
6. THD+N – Target 0.2% but a bit more is acceptable to get lower cost. Noise low enough to be not all that noticeable.
7. Reliability – Should not have more than a couple percent initial defectives and 90% should last beyond a short warranty period. After that it does not matter.

Standard Consumer

This is the gear used for personal listening and in the home mainly as home theatre equipment these days.

Characteristics:

1. Comment –This includes the better audio gear used in most homes.
2. Typical Brands – Apple, Sony, Harmon consumer brands, Samsung, etc. Some of these makers may even include some specifications and graphs.
3. Types of Product – Better earbuds, MP3 players, A/V receivers, surround speakers. TV sets up to 1080i and some 4K product. Some are remote controlled. Amplifiers may include preamps with tone and EQ controls.
4. Where Sold – Department stores and Electronic shops like Best Buy and the like. Amazon EBay
5. Amplification – Mostly class D these days in ICs but may still include some analog.
6. Repairability -Tend to be repaired for simple defects but tend to be replaced for any sort of major defect.
7. Ease of Use – While the controls presented to users may be simple there are often menus for more sophisticated users where they can make major adjustments to settings and configuration.

8. Connections – 1/8 Mini plug, phono jacks, HDMI connectors, wi-fi, bluetooth and optical fiber.
9. Power – MP3 players from rechargeable batteries. Otherwise from line power
10. Operational life – Several years but tend to be replaced when defective or when gear with what appears to the public to be new features comes along. The technology generally has a substantial revolution every decade or so.
11. Technology - Tends to be mainly digital but has analog inputs and outputs as well. Usually used at 44.1K/16 bit but some 24 bit/96K is creeping in..

Requirements include:

1. Safety
2. Compliant to regulatory requirements
3. Decent sound quality
4. Power level - Power levels are from a fraction of a watt in portables up to the 100W or so range in the large A/V receivers. Not intended for sustained high power operation though. Power is generally specified at 1% THD+N. The average power level of the output rarely exceeds 10% of rating though peaks must be reproduced fairly well. On personal music players the maximum power delivered to headphones may be regulated to specific maximum levels.
5. Cost – May be moderate up to US$1000 or so but most is lower than that.
6. Frequency response – Must be from 20Hz to 20kHz. Tends to be rolled off below 20Hz to reduce power supply needs and above 20kHz as 44.1K sampling does not permit higher.
7. THD+N – 0.02% is a common low point on a THD+N curve.
8. Reliability – Few initial defects and tend to last a reasonable time for consumer durables. Most get replaced before failing and service life of a decade or more is common. However these products seldom have a parts or service system behind them to allow much in the way or repair.

Commercial Public Address

This sort of gear is used mainly for announcements using speech in public areas such as transportation facilities and on commercial transport vehicles such as trains and aircraft. May sometimes also be used to play music but that is of secondary consideration.

Characteristics:

1. Comment – Reliability and intelligibility are above all. Even under adverse conditions.
2. Typical Brands – Atlas, Bogen, Rauland and the like
3. Types of Product – Speakers, amplifiers, microphones
4. Where Sold – Commercial sound distributors who also often install and service the gear as well
5. Amplification – May be analog or class D. May have an output transformer for constant voltage systems and impedance matching.
6. Repairability – Generally repaired as needed until parts or assemblies are no longer available.

7. Ease of Use – Simple to use as users receive little training. Setup however is generally done by professionals and can sometimes be very complex, especially where a product may have a DSP or sophisticated switching systems.
8. Connections – XLR connectors, phono jacks, Phone plugs, screw terminals (may be detachable). Locking type connections are preferred. Connections are done for long term reliability and are generally only made by qualified people.
9. Power – AC line power, sometimes with an Uninterruptable Power Supply.
10. Operational life – Indefinite. Expected to operate properly first time and every time for at least a decade and often longer. The technology changes very slowly as regulations change very slowly. Often gear of this type from the 1950s may still be found in service, especially the loudspeakers.
11. Technology - Generally analog electronics of well proven technology though some class D amplification is being introduced as well as DSP technology. However high level of regulation often places the technology decades behind the state of the art.

Requirements include:

1. Safety
2. Compliant to what may be very strong life safety regulatory requirements up to and sometimes including grenades going off near the speakers. Sometimes fire code regulations are in effect.
3. Reliability – Failure may not be an option in a lot of installations. 90%+ of this gear must be in operation after 10 years. Electronics are almost always repaired when failure occurs.
4. Clarity of sound – Must be as clear as possible in the speech range of 300Hz to 3kHz. However this is often sabotaged from poor choices in speaker placement.
5. Power - Power levels can run from a few watts to hundreds of watts. Multiple amplifiers and multi channel amplifiers are often used. May have 25V, 70V and other voltage levels on the output. Power output is generally specified at 1% THD+N but some brands still use a 10% THD+N level
6. Frequency response – 300Hz to 3kHz is most important. Much beyond that is seen as maybe being detrimental to clarity of voice reproduction.
7. THD+N – As long as the sound is intelligible this is not important. Below 1% is considered adequate.
8. Cost – Not that cost sensitive and sometimes stupid expensive to meet safety regulations. However, sales are usually made by qualified installation contractors competing to be the lowest bidder.

Commercial Music Distribution

Characteristics:

1. Commonly used to distribute background music in commercial locations such as restaurants and retail stores. While standard consumer grade audio amplifiers are used in smaller installations, larger ones may use either constant voltage distribution (eg. 70V) or multi-channel amplifiers. Paging may be a secondary function of such systems. Music used for public performance is supposed to be

supplied only by vendors who are licensed to do so by rights holders such as Sting Ray, Mood, Sirius XM Commercial and Emedia Networks. However, in smaller installations the establishment owners do not always pay royalties. This sort of gear is often seen as trade shows like Infocom.

2. Typical Brands – Knoll, Hafler Commercial, Exicon, etc.
3. Types of Product – Digital Music Players, Amplifiers and speakers which would include wall mount and ceiling speakers
4. Where Sold – Commercial sound installation companies
5. Amplification – Generally multi channel Class AB and Class D amplifiers with chip power amp stages are used. The LM3886 is an example of a typical chip amplifier. May or may not have 25V or 75V output.
6. Repairability – Generally pretty good. Parts used tend to be generic types commonly available in most cases for long periods of time.
7. Ease of Use – User controls are generally limited to On/Off and a level control. Installation contractors set everything else up.
12. Connections - XLR connectors, phono jacks, Phone plugs, screw terminals (may be detachable). Locking type connections are preferred. Connections are done for long term reliability and are generally only made by qualified people.
13. Power – AC line power. Sometimes but not often with a UPS.
14. Operational life – Indefinite. Expected to perform trouble free for a decade or more. The speakers are often left unchanged for the life of the business, only replaces as individual units fail.

Requirements include:

1. Safety
2. Compliant to normal regulatory requirements
3. Reliability – Expected to operate without a fuss for 10+ years.
4. Clarity of sound – Must be as clear as possible in the FM radio frequency response range of 40Hz to 15kHz.
5. Power - Power levels can run from a few watts to hundreds of watts. Multiple channel amplifiers often used. May have 25V, 70V and other voltage levels on the output. Power output is generally specified at 1% THD+N. However these amplifiers are rarely played anywhere near full power and the music source is generally normalized to keep dynamic range requirements relatively lower.
6. Frequency response – 40Hz to 15kHz is most important. 20Hz to 20kHz is however expected to be seen in spec sheets.
9. THD+N – As long as the sound is does not actually sound annoying, below 0.2% is considered adequate.
10. Cost – Not that cost sensitive but cannot be stupid expensive as sales are usually made by qualified installation contractors competing to be the lowest bidder.

Professional Sound Reinforcement
Characteristics:

1. This is the equipment used for live music performance in venues from a pub all the way up to an indoor or outdoor arena. Rock Concerts, Festivals, Stage Shows, Auditoriums, etc. This gear is often seen at trade shows such as NAMM.
2. Typical Brands – Renkus-Heinz, QSC, JBL, Electrovoice, Meyer, etc.
3. Types of Product – Speakers (some with built in power amplification), power amplifiers, mixing boards, lots of boxes and switchers on stage and effects racks. Often with digital audio distribution with CobraNet, Dante and the like.
4. Where Sold – Professional sound contractors and music stores (Long & McQuade and Guitar Center) mostly
5. Amplification – Class AB or Class D. Generally either plate amplifiers built into speakers or rack mount amplifiers. While there may be some ICs in drive stages, output stages are generally discrete devices. Large systems may have many amplifiers in racks. Sometimes many racks. Many of the amplifiers used in this application have cooling fans internally.
6. Repairability – This sort of gear may be in service for 10 to 40 years and may be serviced a number of times during its life. Most of this gear is generally made of parts that are readily available for long periods of time. While touring companies may only use some gear for a few years, there is a large resale market for this equipment seeing it being passed down the food chain. Some products from the 70s are still in service.
7. Ease of Use – This is complex equipment that is set up by highly skilled people and usually operated by people with years of experience. Many of the operators have come up from the ranks of `roadies`. This gear is not for the unskilled.
8. Connections – Latching connectors such as XLR connectors for signal and Speakon Connectors for speakers. Sometimes phone plugs are used or even phono connectors but these are discouraged. Speaker cables are generally quite heavy.
9. Power – AC power line. Touring groups with large systems generally bring their own power panel to tie into the mains where it enters the building. Equipment needs to be able to be switched on 120 or240V operation as tours may take equipment to countries with different power standards.
10. Operational life – On tours gear is used for maybe 3 to 5 years as wear is pretty high and utmost reliability is paramount. However when passed onto the resale marker, operational life into several decades is common. Many of the earliest high power solid state amplifiers from the 1970s such as the Crown DC-300 are still in operation.

Requirements include:

1. Safety and this gear must stay safe in rugged conditions. One must not electrocute the guitarist.
2. Reliability – No one piece of gear in a system should ever stop a show. This gear has to take a lot of punishing travel and then just work when set up. However the systems may have a lot or redundancy.
3. Power – Power output on amplifiers is only limited by how much line power is available. Individual amplifiers are often limited by what one can pull through a 20Amp circuit breaker. Generally power outputs up to 2000Watts in a single amplifier are used. However, a few are higher. Amplifiers in this market must be

able to output a sine wave of 1/3 rated power for many hours without overheating. Or with music being run into hard clipping. Other audio gear is only sine wave tested with 1/10 of full power. Power is rated at 1% THD+N most of the time, Sometimes 0.1%.

4. Frequency response – Must have terrific bottom end. Response must have no falling off until below 20Hz and must have tremendous reserve in the power supply to deliver bass notes with impact. To achieve this, the amplifier should be no more than 1dB down at 10Hz. The high end will be flat to 20kHz and no one cares much above that.
5. THD+N – In the 0.01% to 0.04% range at most levels is considered fine these days.
6. Cost – Not that cost sensitive if the brand is well known and known to be reliable. Often purchased as part of a large system. Rarely is any off brand gear used.
7. Compliant to regulatory requirements sort of. Does not always have any real regulatory approval. There is some abuse in this area by makers. FCC approval is only subject to the looser Type A specs and in some cases EMI approvals ignored altogether though this is getting more difficult to do as time goes on.

Professional Recording
Characteristics

1. This is the equipment used in recording studios to make the music. These days the recording is done digitally and the mixing console may also be digital. Sometimes these are similar to live music boards. Power amplifiers are used to monitor the recording and mastering process and the amplifiers and speakers used comprise the reference for the final sound released by the producer. This gear is often seen at trade shows like AES.
2. Typical Brands – Neve, Shure, Hafler and many more.
3. Types of Product – Mixing consoles, monitor speakers (powered or unpowered), power amplifiers, Apple computers, microphones, patch panels, etc.
4. Where Sold – Large music stores and sometimes direct from the manufacturers.
5. Amplification – Monitor speakers with built in amplification pretty well swept away separate amplifiers in the early 2000s. However the realization that the best speaker maker is not necessarily the best amplifier maker has come to the industry in the 2010s. The stand alone amplifiers in use in the 2010s tend to be essentially audiophile grade but with added XLR balanced input connectors
6. Repairability – This gear is expected to be well made and easy to service. Because much of it is made by smaller makers most is made mainly with off the shelf parts and this gear can often be kept running for many decades.
7. Ease of Use – Extremely complex. Many users have taken college level courses ar recording school on how to operate this equipment. It is almost always installed by expert level people.
8. Connections – Mainly XLR connectors and either terminals or Speakon connectors for speakers. Some phone plugs and a few phono jacks.
9. Power – Standard AC power. Sometimes filtered

10. Operational life – Generally replaced every 10 years or so as new technology comes along. This gear is highly prized in the resale market and may be used by lower level users for decades. Some of it, such as mixing boards, makes its way to the lower level live touring market with up and coming acts.

Requirements include:

1. Safety
2. THD+N – Through most of the audio band power amplifiers must be in the 0.0003% to 0.005% range at levels from 0.1W to 50% power..
3. Frequency response has to have no more than 5° of phase shift from 20Hz to 20kHz. Which requires a flat response range from about 5Hz to 50kHz.
4. Quiet – These amplifiers are often used in quiet environments and fans are considered unacceptable in most installations. Cooling must be passive. If fan cooling is needed, the installers will add external fans.
5. Power - In the 75W to 500W range. Generally rated at 0.1%. Sometimes less. Graphs are essential specifications. Rarely played that loud but have to have good dynamic range and low end punch.
6. Cost – Not that cost sensitive. Buyers will pay good money for something that they feel will let them be better at their job.
7. Compliance to regulatory requirements – Generally an after thought. The users do not really care and the makers need only to meet the required safety levels and the minimum EMI standards to allow the gear to be sold in given countries.

Audiophile

1. This gear is used by the audio fanatics always in search of what they see is the musical truth. Where subjective listening and reviews by magazines such as The Absolute Sound determine what is bought. This community is sometimes prone to various “audio urban legends”. However we tend to not dismiss these out of hand any more as some things that have come from this community have turned out to be real effects where the science has not yet caught up with the very real effects found. However others have been determined to be imagined. The point is to not dismiss claims immediately. There are indeed some sonic effects that cannot be measured.
2. Typical Brands – Mark Levinson, Pass Labs, Hafler, Tenor Dynaco and many others. There are dozens of boutique brands with avid followers.
3. Types of Product – Turntables (often with moving coil cartridges) Preamplifiers (often without tone controls) Power amplifiers, speakers and accessories like premium speaker cables,
4. Where Sold – Specialty audiophile stores and sometimes direct from the manufacturers. There is also a hobby market for do it yourself kits and even scratch construction of products in this field. See www.diyaudio.com.
5. Amplification – Almost always Class AB and Class A amplifiers. Rarely class D. Sometimes vacuum tubes are used. It has been noted that whatever brand of tube

is offered in a tube amplifier or pre-amp, users will have their own favorite brand and will almost immediately replace what the maker has put in.

6. Repairability – This gear is expected to be well made and easy to service. Because much of it is made by smaller makers most is made with off the shelf parts as much as possible. Because the people that buy this gear change gear pretty often, there is a strong resale market and this gear can often be kept running for many decades. Some of the top end gear from as long ago as 1955 is still in service.
11. Ease of Use – Fairly easy but many users make it seem more complex. Installation may be very fussy as room placement of the speakers, room reverberation time and listener position are all taken into account,
12. Connections – Mainly phono connectors and speaker terminals for speakers.
13. Power – Standard AC power. Sometimes filtered
14. Operational life – Generally replaced every few years or so as improved technology comes along or the reviewers come across a new darling product. This gear is highly prized in the resale market and may be used by other users for decades. Some speaker designs from the 1930s are still in use as are some amplifiers from that time period. There are even dealers such as Innovative Audio in Surrey BC for used equipment. There are also many places that refurbish old gear in this market.

Requirements include:

8. Safety
7. THD+N – Through most of the audio band power amplifiers must be in the 0.0003% to 0.005% range at levels from 0.1W to 50% power. It has been noted that in blind A/B tests users can tell an amplifier with 0.003% THD+N from one with 0.006% THD+N at levels of 1Watt.
9. Frequency response has to have no more than 5° of phase shift from 20Hz to 20kHz. Which requires a flat response range from below 5Hz to over 50kHz. 100kHz is preferred to give signal proper “air”. Tube amplifiers must at the 1W level or so be able to pass an acceptable square wave into a resistive load with little ringing if any, even to 20kHz. With an input signal of a 40Hz square wave, a tube amplifier at 1W into a resistive load should not have more than about 30° of tilt on the top and bottom.
10. Quiet – These amplifiers are often used in quiet environments and fans are considered unacceptable. Cooling must be passive. If fan cooling is needed, the users will add external fans.
11. Power - In the 10W to 1000W range. Generally rated at 0.1%. Sometimes less. Graphs are essential specifications. Rarely played that loud but have to have great dynamic range and low end punch.
12. Cost – Not that cost sensitive. Buyers will pay good money for something that they feel will let them hear the music better
13. Reliability – Users expect good sounding gear to be a little cranky. Especially tube amplifiers. Tube gear generally only has a 1 year warranty and only 90 days on the tubes. Gentle failure of gear is often tolerated and will be repaired. This gear is often traded in but rarely scrapped.

14. Compliance to regulatory requirements – Generally an after thought. The users do not really care and the makers need only to meet the required safety levels and the minimum EMI standards to allow the gear to be sold in given countries.

Further Reading
http://electronics.stackexchange.com/questions/47236/whats-the-difference-between-consumer-and-pro-audio-equipment

https://en.wikipedia.org/wiki/Professional_audio