INSTALLATION ADVICE AND INFORMATION

FBT - Style, choice and high quality acoustics

FBT Audio Contractor offers a vast and comprehensive range of specially developed installation loudspeakers for all sound requirements and applications. Specifically designed to enable simple and safe installation with a modern and stylish design, FBT loudspeakers are the ideal choice for ambient sound distribution requirements.

All our products (from recessed ceiling loudspeakers to dual-cone fire-resistant, to IP-rated, to industrial and foreground music quality) have been designed and constructed according to the latest electro-acoustical parameters.

The result is absolute excellence - perfect music reproduction and optimal voice clarity. Special attention has been placed on the simplification and reduction in time required to install and connect systems, thanks to the special accessory kits supplied as standard.

The basic principles of effective surface mount ceiling loudspeaker installation

The first priority of a high quality sound reproduction system is that of providing listeners with an acoustic level higher than that of any possible background noise. The system must simultaneously ensure a wide frequency range and maximum intelligibility. It should also guarantee a flat frequency response and uniform sound pressure level to give optimum listening pleasure and clarity. To meet these criteria, the hypothetical ideal solution would be to place each sound source at an equal distance from all required listening points.

Ceiling-mounted loudspeakers

In environments offering suitable ceiling height, this 'hypothetical' ideal standard can be approximated by using loudspeakers with very wide frequency response and dispersion angles which remain consistent at different frequencies, arranged in a ceiling or 'shower'-type configuration.

This provides the following acoustic benefits:

- Maximum sound distribution uniformity
- Maximum speech intelligibility
- Constant quality of music reproduction
- R educed reverberation in the environment
- Sound source remains at a constant distance from the listening position

Once the required loudspeaker type has been chosen and the characteristic parameters considered (eg. dispersion angle, room shape and size), the number of loudspeaker units needed to obtain constant and uniform sound dispersion can be easily calculated. The required speaker quantity is calculated by dividing the floor area in square metres by the area of coverage of each loudspeaker on the listening plane. [Figure 1 clearly illustrates this concept].

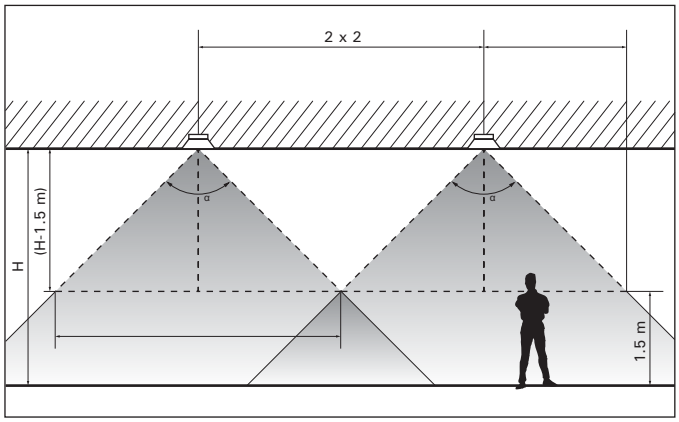


Figure 1

Degrees of protection

The characteristics of a product in terms of its resistance to the penetration of solid objects and liquids is indicated by the letters IP (International Protection) followed by two numbers. The first number identifies the protection against the ingress of solid objects, while the second indicates liquid penetration resistance, in accordance with EN standards 60529-CEI 70-1.

IP degree of protection

The first number identifies the level of protection against the ingress of solid objects. Number from 0 to 6.

The second number identifies the level of protection against penetration of liquids. Number from 0 to 8.

First IP number:

0 Not protected
1 Protected against the ingress of solid objects larger than 50mm
2 Protected against the ingress of solid objects larger than 12mm
3 Protected against the ingress of solid objects larger than 2.5mm
4 Protected against the ingress of solid objects larger than 1mm
5 Protected against dust penetration
6 Totally dust-proof

Second IP number:

0 Not protected
1 Protected against vertically dripping water
2 Protected against water dripping at an angle (up to 15° from the vertical)
3 Protected against rain
4 Protected against water spray
5 Protected against water jets
6 Protected against waves
7 Protected against the effects of temporary immersion
8 Protected against the effects of permanent immersion

Speakers, Decibels, SPL

Lose 6dB each time distance is doubled from speaker	Add 3dB when power is doubled		
Distance from Speaker >>>	**1m**	**2m**	**3m**
SPL(dB) @ 1W	**95**	**89**	**83**
SPL(dB) @ 2W	**98**	**92**	**86**
SPL(dB) @ 4W	**101**	**95**	**89**
SPL(dB) @ 8W	**104**	**98**	**92**
SPL at listening point should be 6 to 10dB above ambient			

Quantity of Ceiling Speakers per Sq/metre for background music

Ceiling Height = 2.5m Speaker Spacing = 5m
Coverage = 25 Sq.m

Floor Area	Quantity of Speakers		Wattage Taps in Area
100 Sq.m	4 Speakers		Quiet 55dB Tap @ 1W
250 Sq.m	10 Speakers		Normal 60dB @ 2W
1000 Sq.m	40 Speakers		Noisy 65dB Tap @ 3W

Wall-mounted loudspeakers

If the architectural features of the room are not compatible with ceiling-mounted loudspeakers or if a wall-mounted solution is preferred, it is essential to observe a few basic rules to obtain the most effective sound distribution. In order to maintain the most efficient listening point inside the direct signal area, both in-wall and surface mounted loudspeakers with power from 6 to 20Watt should be installed at a height between 2 and 2.5m.

The maximum distance between adjacent loudspeakers must be no more than 5~6 metres along the length of the room, where the room is no wider than 4~5 metres.

For wider rooms (eg, 8~10 metres), it is recommended to install loudspeakers in an alternate pattern along both opposite walls, to provide adequate coverage and maintain sound pressure at the best possible constant level throughout the area for coverage [see Figures 2 and 3].

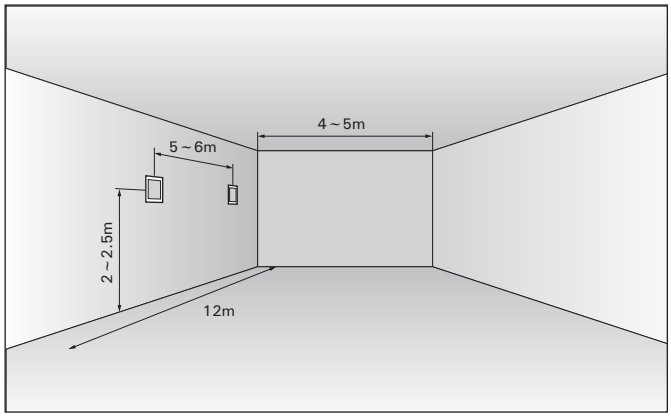


Figure 2

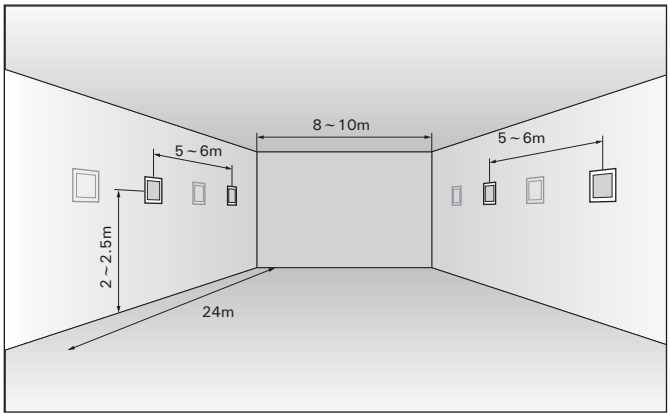


Figure 3

Corridor/'Tunnel' Area Coverage

For effective sound distribution in corridors, tunnels or passenger platforms in railway/underground stations, horn speakers are specified for increased voice clarity in these high ambient noise conditions. For higher quality sound reproduction, 'sound projectors' can be used as an alternative.

In all cases, these loudspeakers must be installed at a maximum distance of 15 metres from one another, mounted all in the same direction and in observance with the phase of each loudspeaker. Alternatively bi-directional versions of these loudspeakers can be considered, positioned at a maximum of 30 metres apart (again observing phasing) [see Figure 4].

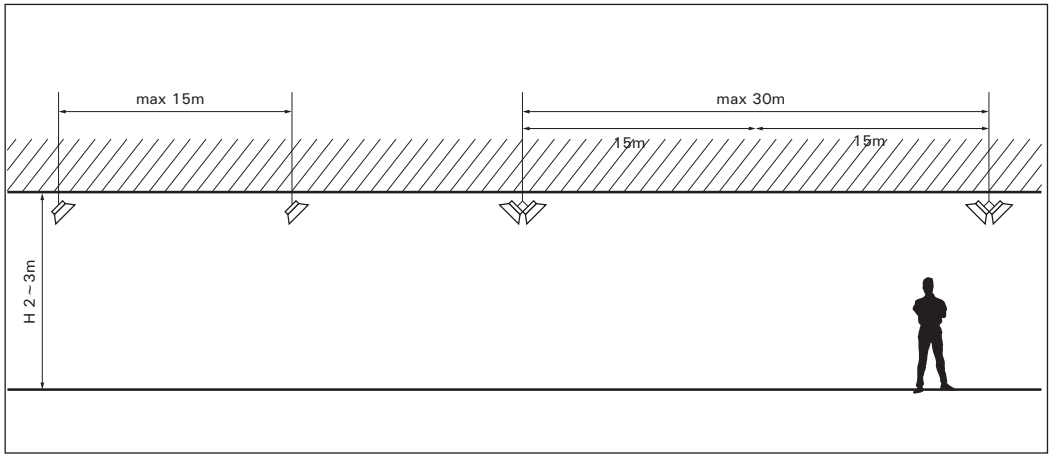


Figure 4

Low Impedance

Constant impedance lines (low impedance) are used above all in the case of a low number of loudspeakers, placed at a minimum distance from the amplifier (<20m).

The constant voltage connection system (e.g. 100V line)offers a host of advantages making it ideal for sound systems of all sizes, above all in the case of long distance speaker runs. This connection system requires each loudspeaker to be equipped with its own line transformer, which adapts the impedance of the loudspeaker (usually very low) to the much higher level of the line itself. In proportion to power transmitted, the current circulating on a line at 100V is considerably lower than that circulating on wires of a constant impedance system, and consequently drops along the line are less frequent; therefore the cable guage can be lower.

The function of the amplifier device is **to raise the signal of a sound source**, such as a microphone, CD player, cassette recorder or an AM/FM tuner **to a sufficient level to pilot the transducer LOUDSPEAKER.** The amplifier has several inputs, to which the various sound sources are connected.

The sound sources have to be mixed (mixer) and acoustically modified with tone control and equalisers to optimise listening in relation to the environment's characteristics. A terminal board is also fitted on output indicating impedance and voltage to which the loudspeaker line is connected.

A few basic rules must always be observed:

1. **When the load is on constant impedance , this must be connected to the relative socket.**
   For example, a load of 4 ohm must be connected to a socket marked 4 ohm, and so on. The power that the load can withstand must always be greater than the amplifier's rated power.
   For example in the case of a load of 100 Watt, the amplifier must have a power equal to or less than 100 Watt.
2. **When the load is at constant voltage , this must be connected to the sockets indicating output at constant voltage -50, 70 or 100 Volt; the power that the load can withstand must always be less than or equal to the amplifier rated power. For example load of 100 Watt, the amplifier must have a power equal to or greater than 100 Watt.**

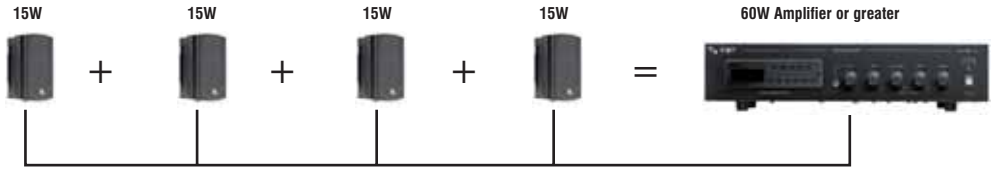
To calculate the required value of a 100V line amplifier power, simply add together the power of each loudspeaker. (See Figure 5.)

However, on a constant impedance system, the load must have an equivalent impedance (series/parallel) equal to or greater than the minimum value indicated on the amplifier output. (See Figure 6.)

The loudspeaker power supply lines, with no connected attenuator, must be with 2 sheathed wires; cables with 3 sheathed wires are required in the case of lines using attenuators which can be disabled if an emergency is activated. Adequate wire sections are required: 1.5 mm^2 for lines up to 500 Watt power 2.5 mm^2 for lines with power over 500Watt. The following general standards must also be observed:

- Never use a single cable (lead) for loudspeaker connections: this would cause disturbance producing a loud "HUM"
- Never use shielded cables for the loudspeaker connections: this would cause serious damage to the power units.

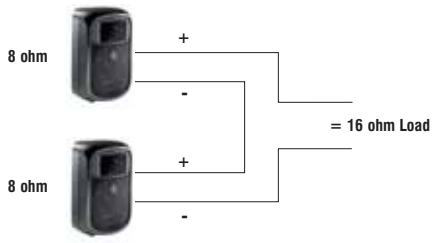
100V Line Speaker Load



Amplifier power should be equal to or greater than the total speaker load (preferably leaving approx. 20% available power, where possible.

Figure 5

Low Impedance Speaker Load



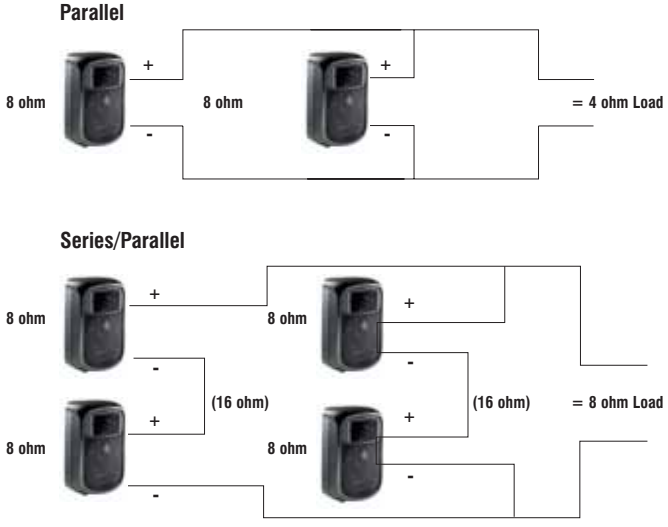


Figure 6