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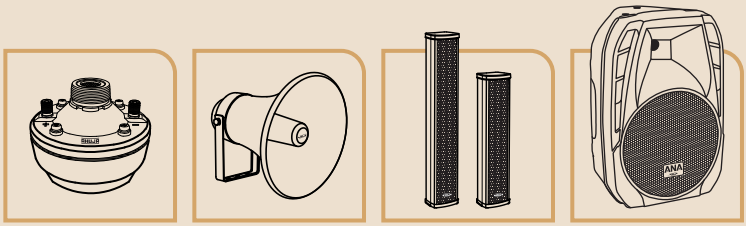
Public Address Loudspeaker Connections

GUIDE BOOK



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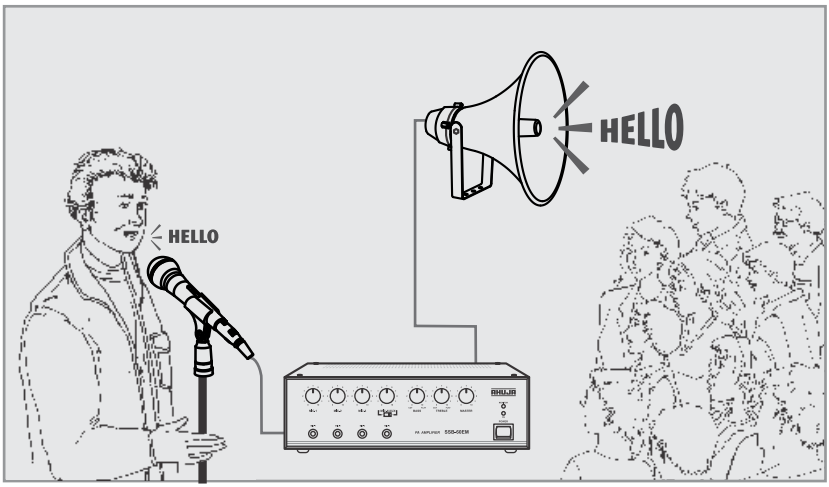
AUGUST. 1-1971


TESTING
SECTION

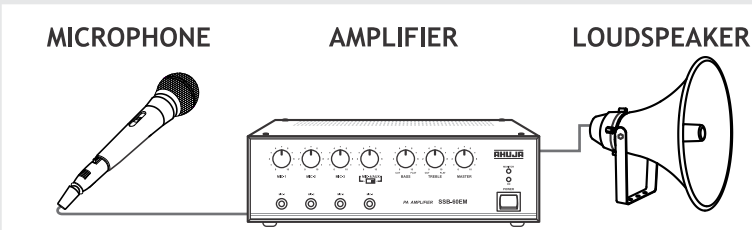
Q 1. **What is a Public Address System (PA SYSTEM)?**

A 1. A Public Address System amplifies low level sound to a higher level so that it can be heard by large number of people gathered and at a considerable distance.



Q 2. **What basic equipment makes up a PA System?**

A 2. A basic PA system has:



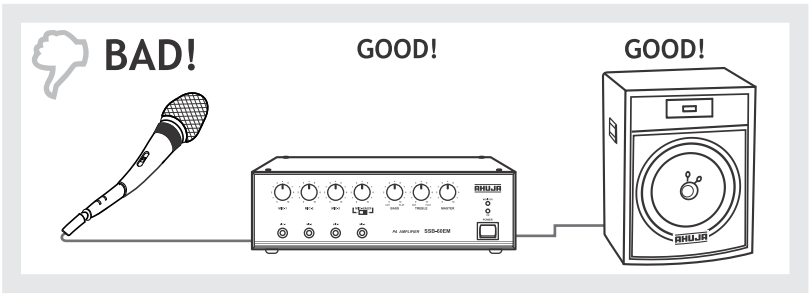
INPUT SOURCE: Such as a microphone for picking up low level sound like human speech. Examples of some other input sources are USB player for playback of recorded music or a compact disc player.

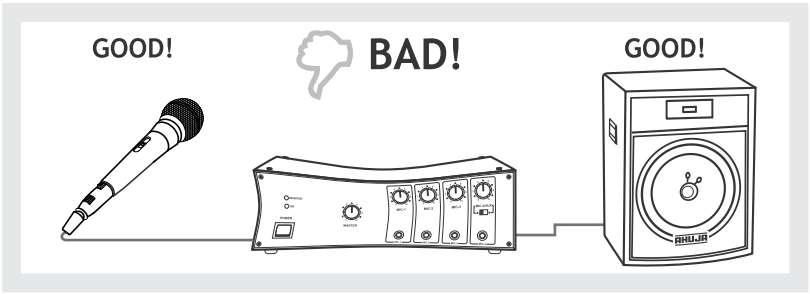
AMPLIFIER: This amplifies the low level input sound from the input source to a higher level.

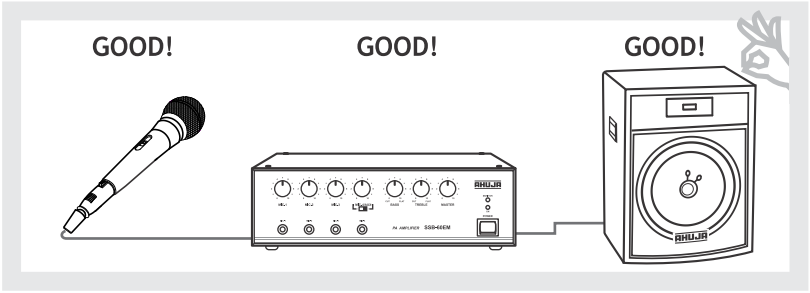
OUTPUT DEVICE: Such as a loudspeaker that reproduces the amplified higher-level sound.

Q 3. Why should all the equipment be of good quality?

A 3. Even if any one equipment or item is of poor quality, the sound quality will be bad.

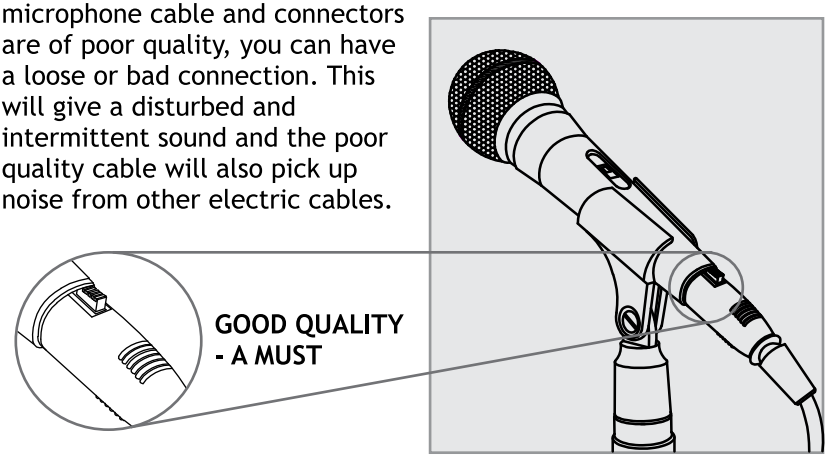






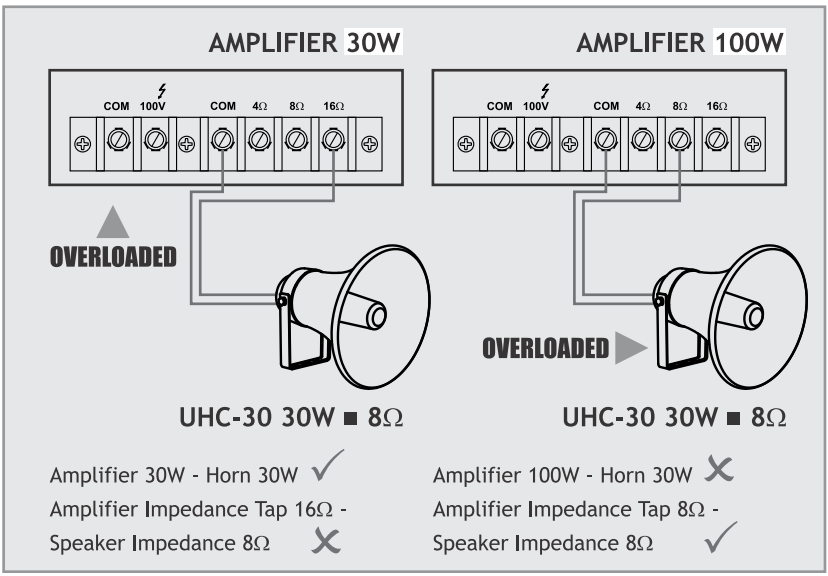
Q 4. **If I have all equipment of good quality, will it guarantee a trouble free and satisfactory performance?**

A 4. *Not necessarily!* Because it is also very important to use good quality connecting cables and connectors. For example, if the microphone cable and connectors are of poor quality, you can have a loose or bad connection. This will give a disturbed and intermittent sound and the poor quality cable will also pick up noise from other electric cables.



Q 5. **What is the importance of correct loudspeaker connections?**

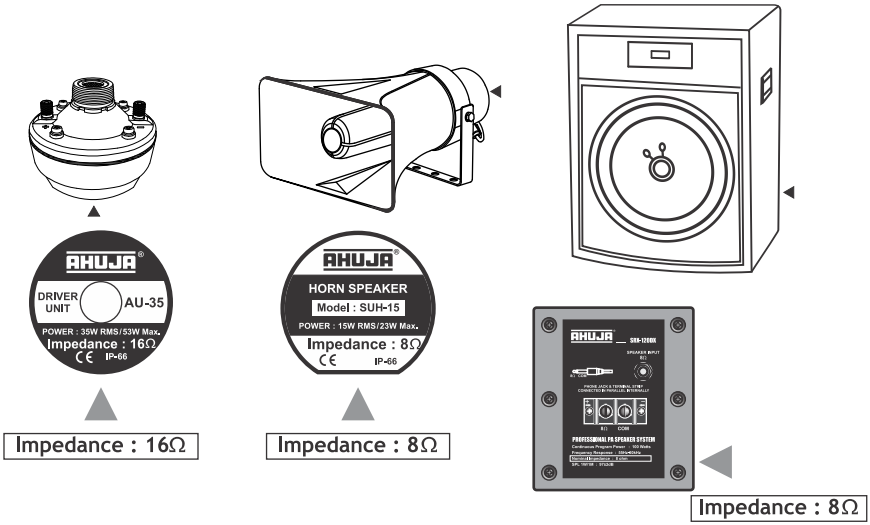
A 5.



This is very important. Wrong connections can damage either the amplifier or loudspeaker. Improper connections lead to poor quality of sound as well.

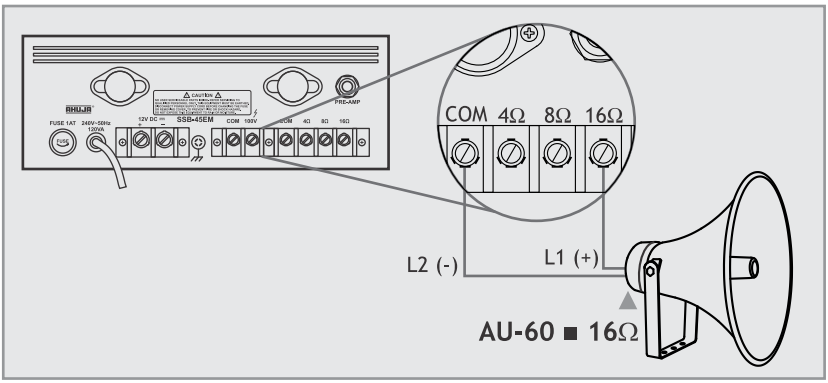
Q 6. What do we mean by 'impedance' of a loudspeaker?

A 6. It is a specification of a loudspeaker, which is very important to know for correctly connecting loudspeakers to an amplifier. Normally loudspeakers have impedance of 4 ohm, 8 ohm or 16 ohm (symbol for ohm is Ω).



Q 7. How do we connect one AU-60 to SSB-45EM amplifier?

A 7.

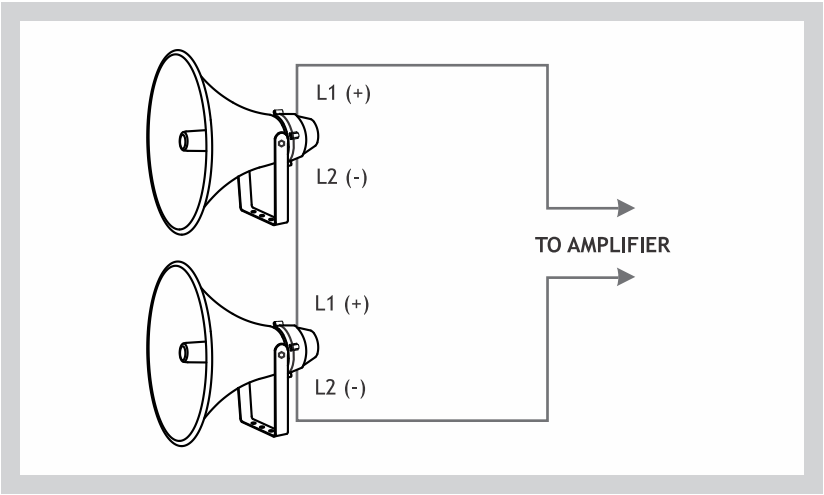


Q 8. Can we connect more than one loudspeaker to an amplifier?

A 8. Yes, we can connect more than one loudspeaker to an amplifier either in **series,** in **parallel** or in a **series-parallel combination**.

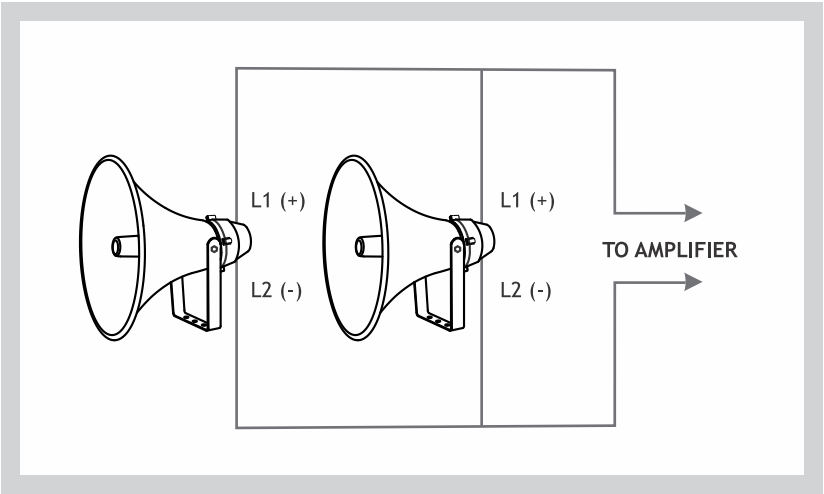
Q 9. What is series connection of loudspeaker?

A 9.



In series connection the L2 (-) terminal of one driver unit / loudspeaker is connected to L1 (+) terminal of the second driver unit/loudspeaker.

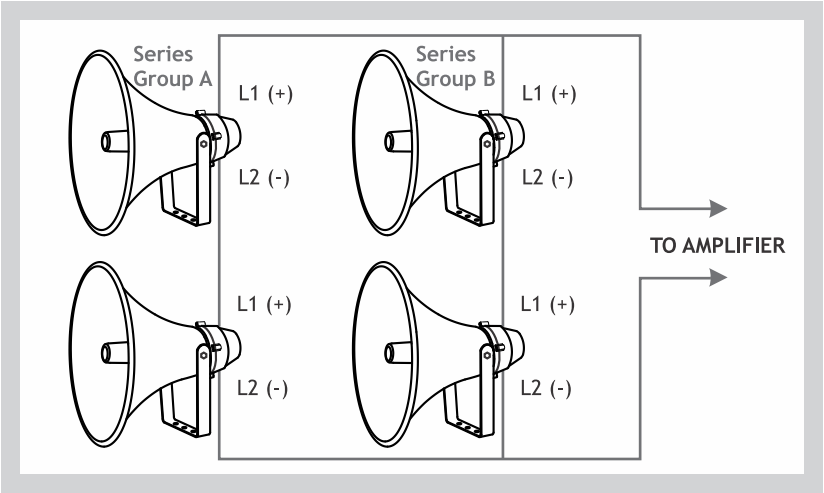
Q 10. What is parallel connection of loudspeaker?



A 10. In parallel connection the L1 (+) terminal of one driver unit / loudspeaker is connected to the L1 (+) terminal of the second, and the L2 (-) of the first one is connected to the L2 (-) terminal of the other.

Q 11. What is a combination series-parallel connection of the loudspeaker?

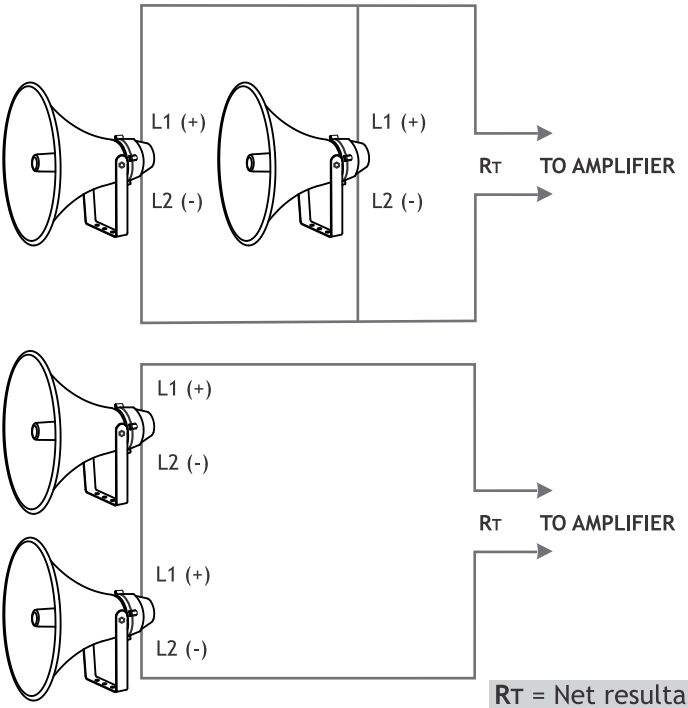
A 11.



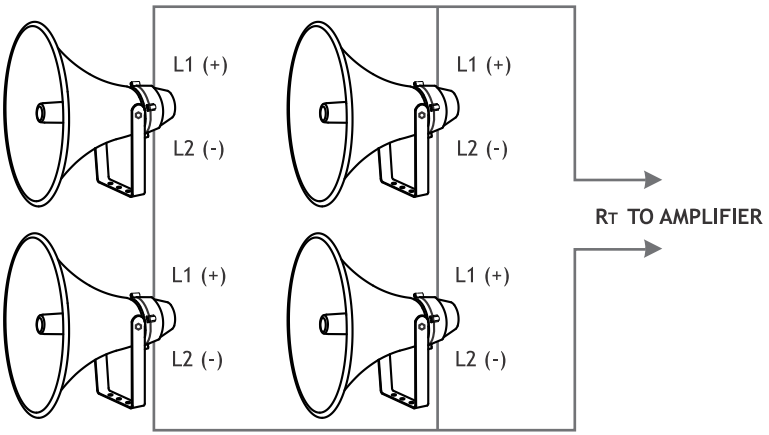
Two or more driver units / loudspeakers are first connected in **Series** and then the **SERIES GROUPS** are connected in **Parallel.**

Q 12. What is the resultant impedance or total impedance RT?

A 12.



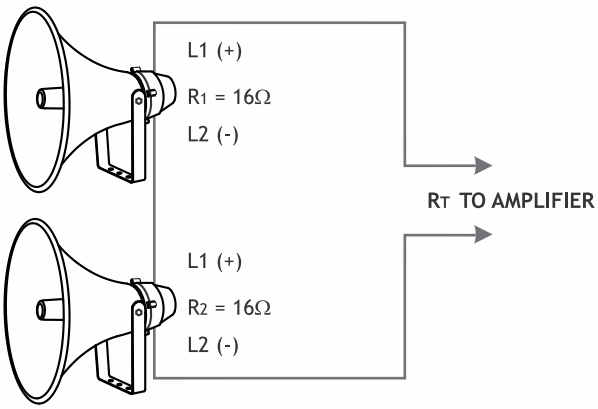
RT = Net resultant impedance



When more than one driver unit / loudspeaker is connected in a combination to an amplifier, the combination has a resultant or total impedance **RT**.

Q 13. How do we calculate the resultant impedance in a series connection?

A 13.



R_1 = 16 ohm

R_2 = 16 ohm

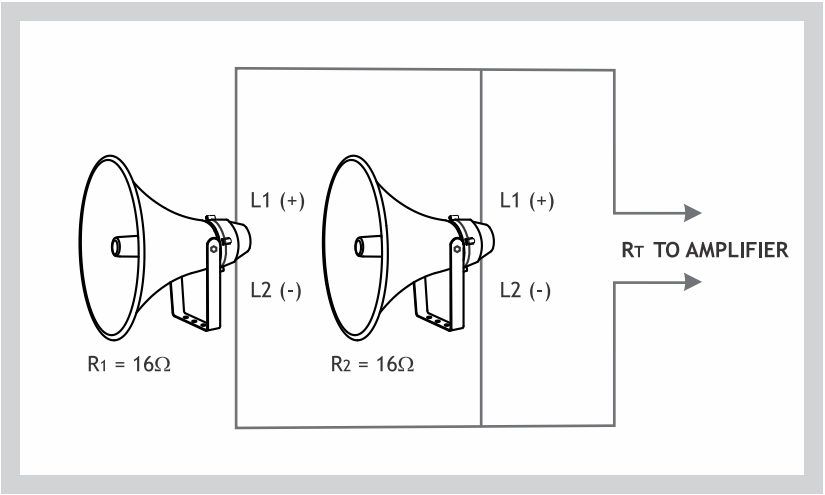
$R_T = R_1 + R_2$ = 16 ohm + 16 ohm = 32 ohm

When speakers are connected in series, **the total impedance R_T is the sum of the impedances of each speaker.**

R_T = Net resultant impedance

Q 14. How de we calculate the resultant impedance in parallel connection?

A 14.



$R_1 = 16\Omega \qquad R_2 = 16\Omega$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_T} = \frac{R_1 + R_2}{R_1 \times R_2}$$

$$R_T = \frac{R_1 \times R_2}{R_1 + R_2}$$

$$R_T = \frac{16 \times 16}{16 + 16} = \frac{256}{32} = 8\Omega$$

If the impedance of the driver units / loudspeakers connected is **SAME** then resultant impedance:

R_T = Impedance of one speaker ÷ No. of speakers

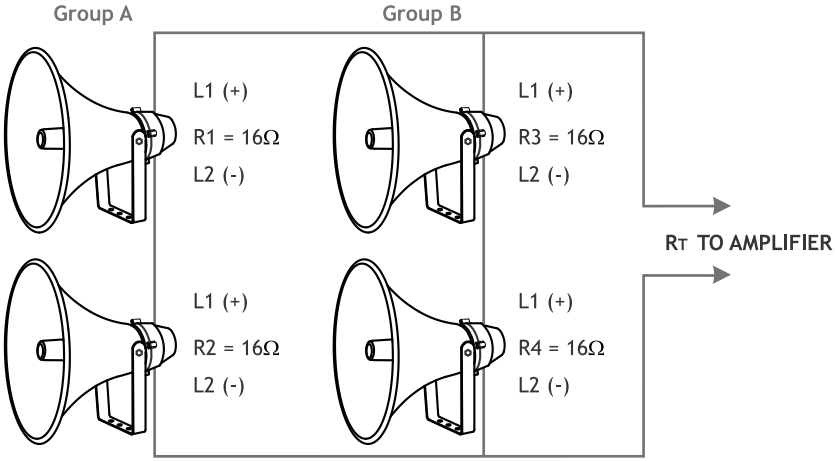
e.g. 1) Impedance of each speaker = 16Ω
No. of speakers = 2
R_T = 16W ÷ 2 = **8Ω**

e.g. 2) Impedance of each speaker = 16Ω
No. of speakers = 4
R_T = 16W ÷ 4 = **4Ω**

R_T = Net resultant impedance

Q 15. **How do we calculate the resultant impedance in a combination of series-parallel connection of speakers?**

A 15.



Impedance of Group A = $R_A = R_1 + R_2 = 16 + 16 = 32\Omega$

Impedance of Group B = $R_B = R_3 + R_4 = 16 + 16 = 32\Omega$

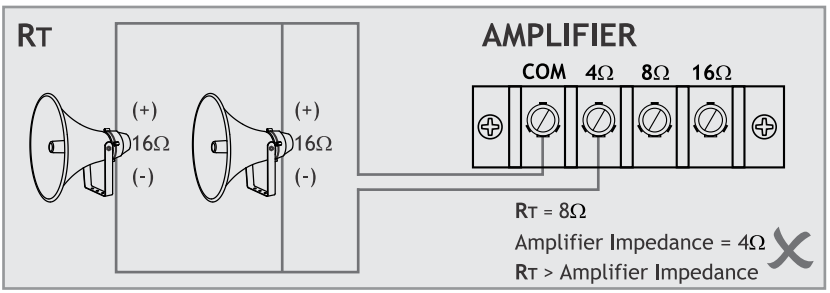
$$R_T = \frac{R_A \times R_B}{R_A + R_B} = \frac{32 \times 32}{32 + 32} = \frac{1024}{64} = 16\Omega \qquad \frac{32}{\text{No. of Groups}} = \frac{32}{2} = 16\Omega$$

Q 16. **What is the importance of impedance matching?**

A 16. For **correct Transfer of Power** from the amplifier to the speaker group **RT** and to **prevent excessive heating** of the amplifier we require **correct Impedance Matching.**

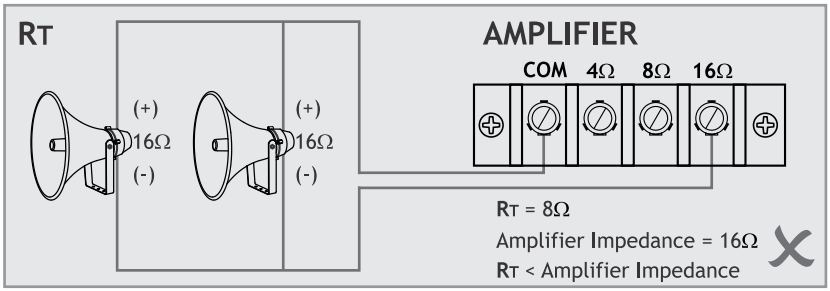
For example let us say **RT** = 8Ω

(i) If **RT** is **more than the Impedance Tap of the Amplifier** it is connected to, the **Speaker Group will draw less current from the Amplifier** and the **Sound Output from the Speakers will be less.**

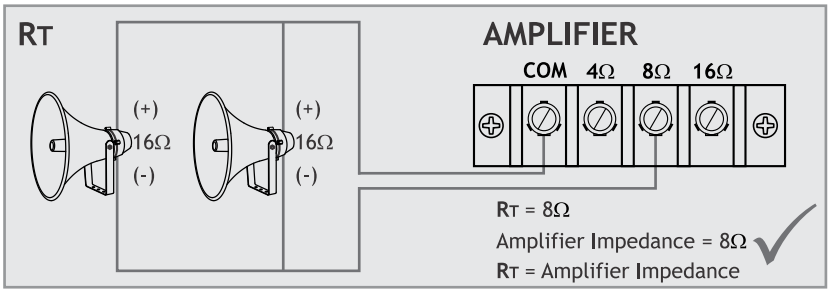


RT = Net resultant impedance

(ii) If RT is **less than the Impedance Tap of the Amplifier** it is connected to, the **Speaker Group will draw more current from the Amplifier, overheat the Amplifier** and **damage the Output Transistors of the Amplifier.**



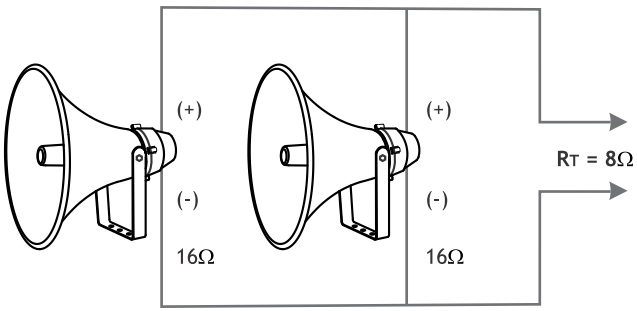
(iii) If RT is **same as the Impedance Tap of the Amplifier** it is connected to, then the **Sound Output** will be **OK** and also the **Amplifier will not get overheated.**



Example:

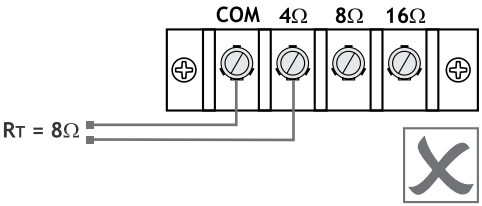
a) **Amplifier model : SSB-60EM**

b) **Speaker group of 2 nos. driver unit AU-40**



RT = Net resultant impedance

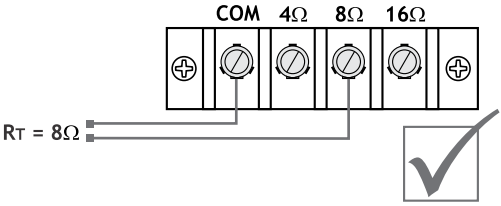
(I) **AMPLIFIER**



AMPLIFIER IS SAFE

RT is connected to COM and 4Ω of SSB-60EM. **Power delivered to the speakers will be less,** but the **Amplifier will run safely.** In this case, the **Amplifier will deliver about 30 Watts, instead of full 60 Watts, to the Speaker, as the current drawn from the Amplifier will be about half of normal current.** Because the current drawn from the amplifier is less, the amplifier will not heat up and it will be safe.

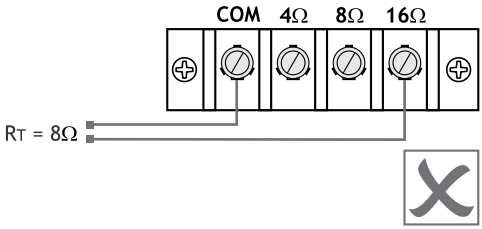
(ii) **AMPLIFIER**



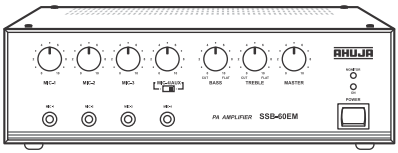
AMPLIFIER IS SAFE

RT is connected to COM and 8Ω of SSB-60EM. The **Amplifier will deliver 60 watts, to the Speaker Group, as the current drawn from the Amplifier will be equal to normal current.** The amplifier will be safe.

(iii) **AMPLIFIER**



AMPLIFIER UNSAFE



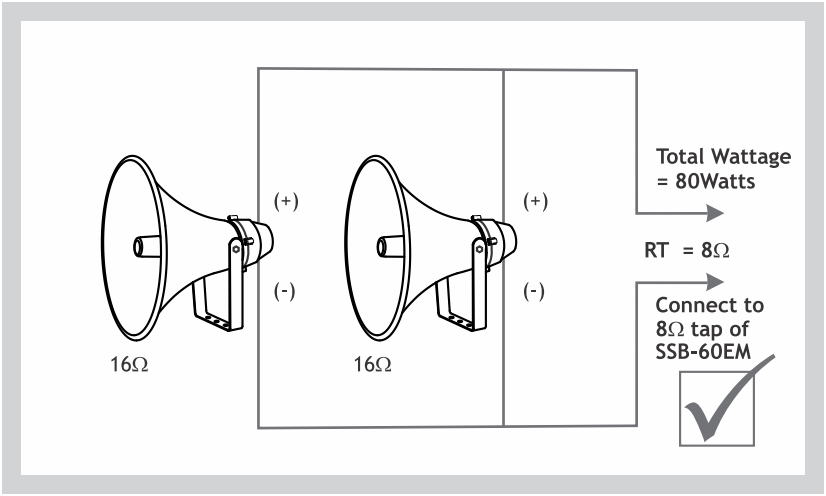
RT is connected to COM and 16Ω of SSB-60EM. **The current drawn from the Amplifier will be approx TWO times of normal current and the high current will overheat the Amplifier and damage the Output Transistors of the Amplifier.**

RT = Net resultant impedance

Q 17. **How many driver units can I connect to an amplifier?**

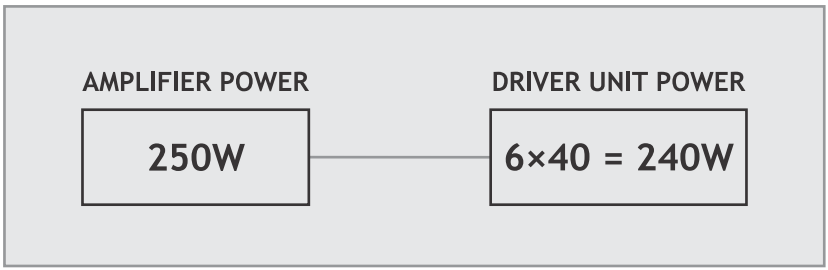
A 17. To **avoid damage to the Speakers** the **Total Wattage of the Driver Units** should **be at least 30% higher than the Rated Power of the Amplifier.**

For example, you should connect at least :
2 Driver Units AU-40 (Total Wattage 2 × 40 = 80W) to
Amplifier SSB-60EM (Rated Output = 60W).



Q 18. **Why should I not connect 6 Driver Units AU-40 (6 × 40W = 240W) without a LMT to a SSA-250M (Amplifier rated power = 250W)?**

A 18. Because when the Amplifier is working, some signals of the program will be **more than 250W** and therefore, the driver units will be unsafe and can get damaged.



RT = Net resultant impedance

Q 19. What should be the minimum number of driver units I should connect directly without LMT with different amplifier models?

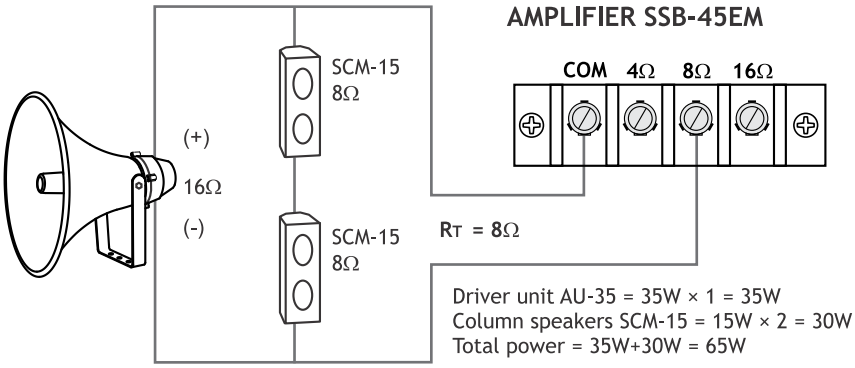
A 19. The minimum number of driver units of different models that need to be connected, for safe operation of the driver units, to various models of amplifiers is as given in the table below:

MODEL	RATED POWER	AU-35 (35W)	AU-40 (40W)	AU-60 (60W)	REMARKS
SSB-45EM	45W	2	2	1	
SSB-60EM	60W	4	2	2	
SSB-80M	80W	4	4	2	
SSA-100M	100W	4	4	2	
SSB-120	120W	4	4	4	
SSA-160EM	160W	8	8	4	
SSA-250M / BR-250M	250W	-	8	8	
APA-240	300W	-	-	8	
APA-480	350W	-	-	8	
SSA-350	350W	-	-	8	
SSA-5000EM / SPA-5000EM	500W	-	-	-	Use only with Line Matching Transformer.
TZA-1200*	60+60W	4+4	2+2	2+2	
TZA-1500*	80+80W	4+4	4+4	2+2	
TZA-2000*	100+100W	4+4	4+4	2+2	
TZA-4000EM	200+200W	-	8+8	4+4	
BTZ-7000*	350+350W	It is recommended that with such amplifiers use Driver Units only with 100V LMT			

* Denotes TWO ZONE AMPLIFIER

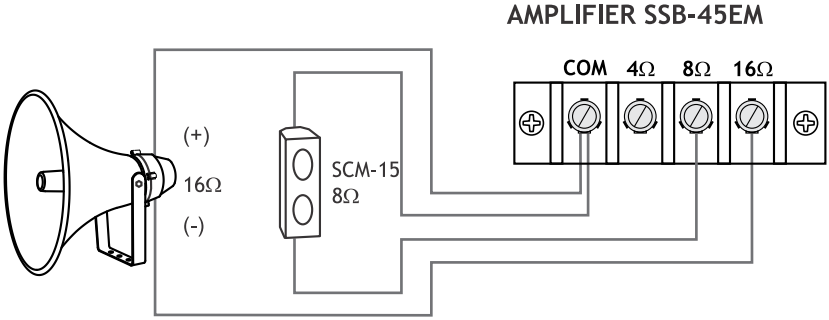
Q 20. Can we connect a combination of horns and column speakers together to an amplifier?

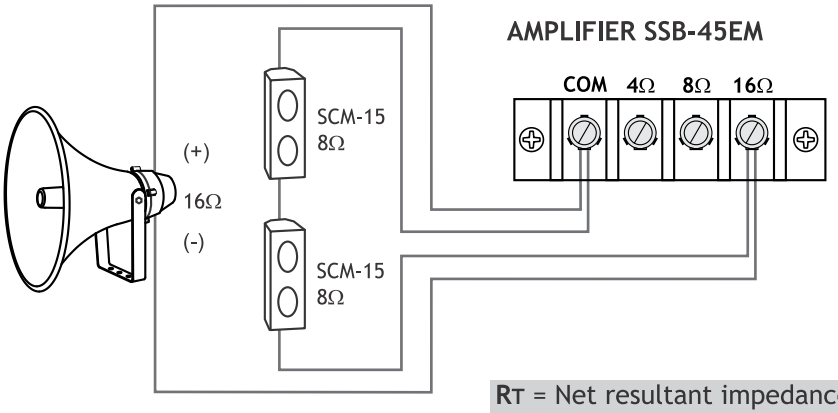
A 20.



YES, we can connect a combination of horns and column speakers together as long as **correct Impedance matching is done** and the **Total Power of the Driver Units and Column Speakers is more than the rated power of the Amplifier.**

However, some common mistakes committed by users are:



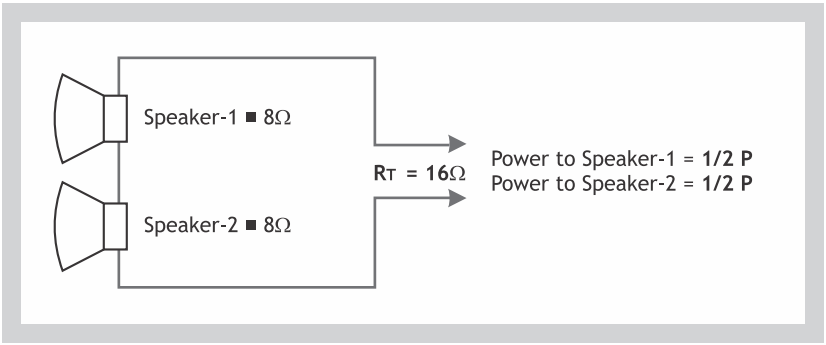


RT = Net resultant impedance

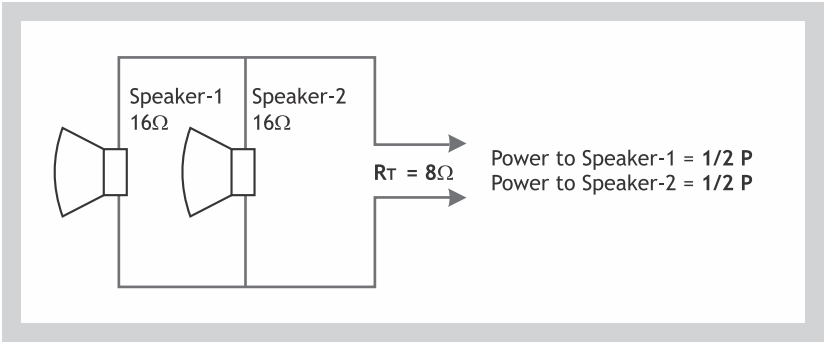
Q 21. How is the output power of the amplifier distributed when we connect a combination of speakers to the amplifier?

A 21. Let the output power of the amplifier = **P**

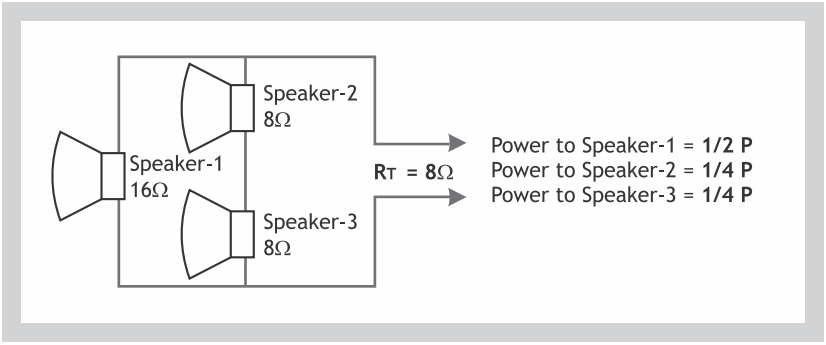
(i) Series connection:



(ii) Parallel connection:



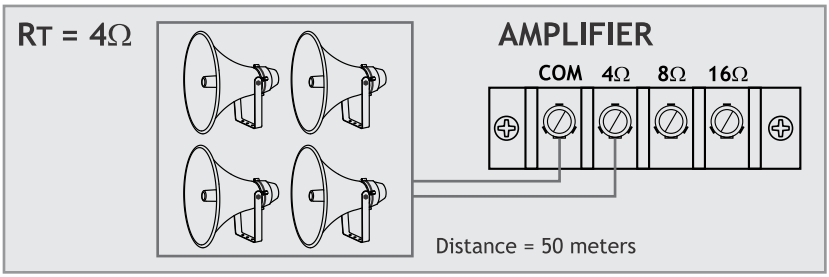
(iii) Series-parallel connection



RT = Net resultant impedance

Q 22. **Can I connect four AU-40 is parallel to SSA-100M at a distance of 50 meters?**

A 22.



When the **length of cable (wire) between the Speakers and the Amplifier is 50 meters or more, then there is big loss of power in the cable.** This loss depends on the thickness and the length of cable used. Table below gives the different type of cables and the loss of power in these:

Cable type	Output from Amplifier	Loss in cable	Effective wattage at the speaker
23/36	100W	38W	62W
40/36	100W	26W	74W

Q 23. **When I use wire sizes 23/36 or 40/36 for connecting speakers / driver units at a distance of 50 meters, what would be the power loss in cables for different models at different low output impedance taps?**

A 23. The power losses for various types of wires are:

Wire size = 23/36 (23 strands of 36 SWG)

Output from Amplifier	Power Loss in Cable	
	4Ω Tap	8Ω Tap
160W	62W	38W
250W	96W	60W
350W	135W	83W

Wire size = 40/36 (40 strands of 36 SWG)

Output from Amplifier	Power Loss in Cable	
	4Ω Tap	8Ω Tap
160W	43W	24W
250W	66W	38W
350W	93W	54W

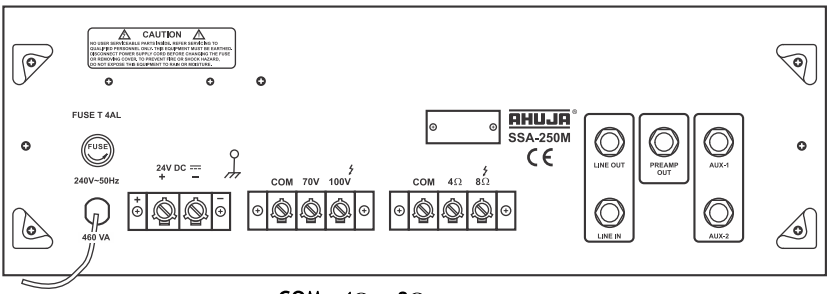
RT = Net resultant impedance

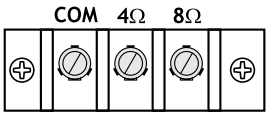
Q 24. I understand that there is a big loss of power when long cables are used for connecting speakers to an amplifier. How can I prevent this loss of power?

A 24. For efficient transfer of power from the amplifier to the speaker, you should use **Speakers with LMTs (100 volt line matching transformer).**

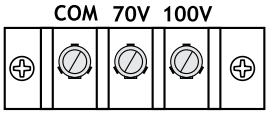
Q 25. On the back of an Amplifier (SSA-250M), I find two terminal strips. On one the marking is COM, 4Ω, 8Ω and on the other strip the marking is COM, 70V, 100V. Why does one have marking of Ω (ohm) and the other of V (volts)?

A 25.





The **terminal strip with Ω (ohms)** marking are used for connecting combination of **low Impedance Speakers or Driver Units (without LMT)** with impedances such as 4Ω, 8Ω and 16Ω. Example: driver units AU-40, AU-60; speakers SAX-200DX, SRX-250DXM, horn speaker UHC-30 etc.

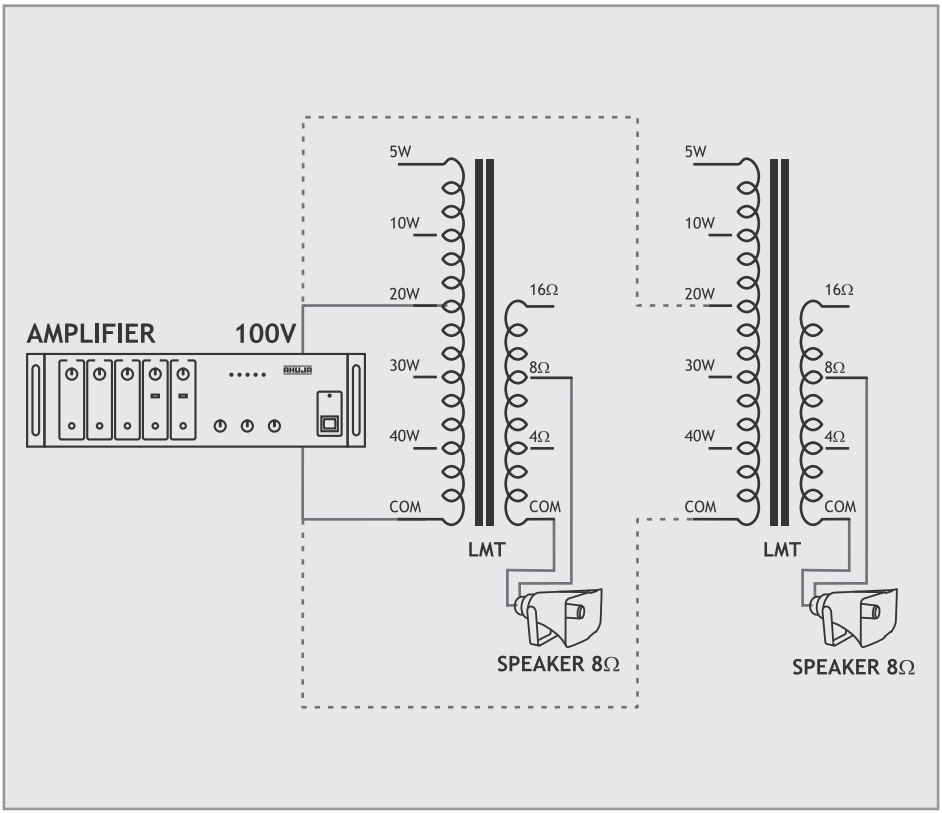


The terminal strip with V (volt) marking are used for connecting **Speakers / Driver Units with LMT (line matching transformer).** Example: driver unit AU-40XT, horn speakers UHC-30XT, SUH-25XT, column speakers SCM-30T, ASC-40T (all 'T' models) etc.

Q 26. What is a LMT and where is it used?

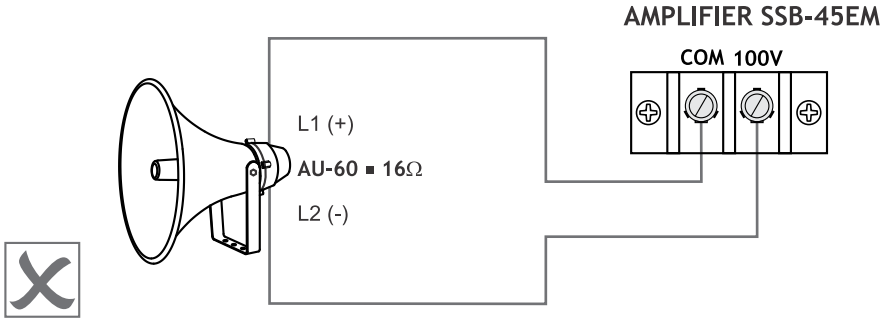
A 26. LMT: line matching transformer.

LMTs are used in a large installation which require a large number of speakers to be connected at a distance. As the length of the cable increases so the strength of the sound signal decreases due to cable losses. Hence, in installations where the length of the cable is substantial, LMTs are used. When using LMTs the 100V line is used. This 100 volt line system is comparable to the electricity distribution system. In electricity distribution system a large voltage is transmitted to the sub-station. Such high voltage is transmitted to overcome losses in cables over large distances. This voltage, before being supplied to houses, is reduced using a step-down transformer. Similarly, a high voltage signal of 100 volts is fed to the LMTs. These LMT's act as step down transformers. As the electricity wiring system in houses is done in parallel similarly all the wiring when using LMT is done in parallel.



Q 27. What happens if I connect driver unit AU-60 (16Ω) to COM and 100V terminals of SSB-45EM?

A 27.



The impedance at 100V output tap of SSB-45EM will be 222Ω. Therefore, if you connect a 16Ω driver unit to a 222Ω (100V) tap, it is like shorting the amplifier output and the driver unit will draw heavy current from the amplifier. This will damage the amplifier as well as the diaphragm of the driver unit.

These 100V terminals are for connecting speakers / driver units with LMT only. Connecting directly without LMT can cause damage both to the speaker and the amplifier.

Q 28. How did we calculate the impedance at 100V tap of SSB-45EM as 222Ω?

A 28. This is calculated by using Ohm's law, which is

$W = V^2/R$

Rated Power of SSB-45EM is 45 watts.

W = 45W

V = 100V

W = $V^2 \div R$ or R = $V^2 \div W$

R = (100 × 100) ÷ 45 = 222 ohms.

A table giving impedances at 100V and 70V output taps of various models is given below:

Model	Impedance at 100V	Impedance at 70V
UTR-30E/UB-30	400Ω	—
UTR-40/DPA-370	333Ω	—
PA-400S/PA-400DS	250Ω	—
SSB-45EM	222Ω	—
DPA-570M	200Ω	—
SSB-60EM	167Ω	—
DPA-770M	133Ω	—
SSB-80M/SSB-85FX/SSB-80DFM	125Ω	61Ω
SSA-100M	100Ω	49Ω
SSB-120/SSB-120DP	83Ω	41Ω
SSA-160EM/SSA-160DP	63Ω	31Ω
SSA-250M/BR-250M/SSA-250FX/ SSA-250DP	40Ω	20Ω
APA-240/AMA-240DP	31Ω	15Ω
MXA-3500/SSA-350	29Ω	14Ω
SSA-5000EM/SPA-5000EM/ SSA-5000DP	20Ω	10Ω
APA-480	17Ω	8Ω
SSA-7000	14Ω	7Ω
SSA-10000/SPA-10000	10Ω	5Ω
SPA-15000	7Ω	3Ω
SPA-25000	4Ω	2Ω
TZA-1200	167 + 167Ω	—
TZA-1500/TZA-150DP	125 + 125Ω	61 + 61Ω
TZA-2000/TZA-2000DP	100 + 100Ω	49 + 49Ω
TZA-4000EM/TZA-4000DP	50 + 50Ω	25 + 25Ω
BTZ-7000/TZA-7000	29 +29Ω	14 + 14Ω
TZA-7000DP		
BTZ-10000	20 + 20Ω	10 + 10Ω

Q 29. What is the impedance at different power taps of 100V LMTs.

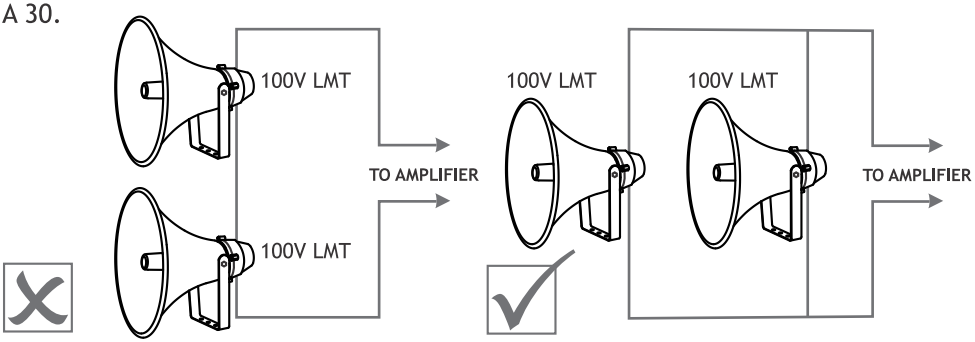
A 29. Table below gives impedances at various power taps of a 100 volt line matching transformer (LMT):

Power Tap	Impedance	Models in which tap is available
90W	111Ω	ASX-912BT, SMX-902T
60W	167Ω	ASX-612BT, ASX912BT, SMX-602T, SMX-902T
50W	200Ω	AU-50XT
40W	250Ω	AU-40XT,CSD-8401T, ASX-612BT, GS-6401T, AU-50XT, SUH-40XT, AMH-402T
32W	312Ω	PS-500T
30W	333Ω	AU-40XT, UHC-30XT, ASC-40T, SP-6305TD OSX-66T, SRX-50XT, SMX-902T, ASX-312BT, ASX-612BT,ASX-912BT, SMX-302T, SMX-602T, SUH-40XT, CSD-6303T
25W	400Ω	UHC-25XT, UHC-30XT, SUH-25XT SP-5251T, WS-6255T
20W	500Ω	AU-40XT, UHC-25XT, UHC-30XT, SUH-25XT, SCM-30T, ASC-40T, ASC-320T SRX-50XT, ASX-312BT, ASX-612BT, SP-6305TD, GS-6401T, SUH-40XT, CSD-5201T, CSD-8401T, SP-5251T, AMH-402T, AU-50XT
16W	625Ω	PS-400T, PS-500T
15W	667Ω	UHC-15XT, UHC-25XT, UHC-30XT, SUH-15XT, SUH-25XT, SCM-30T, ASC-20T, ASC-315T, ASC-320T, ASX-312BT, ASX-912BT, SMX-302T, SMX-602T, SP-5251T, OSX-66T, CS-8151T, CSD-6303T, WS-6225T
10W	1,000Ω	UHC-15XT, UHC-25XT, UHC-30XT, SUH-15XT, SUH-25XT, AU-40XT, SCM-30T, SCM-15T, ASC-20T, ASC-40T, ASC-310T, ASC-315T, ASC-320T, EHC-10XT, SP-5251T, CSX-6101T, CSD-5201T, CS-8151T, CSD-8401T, WS-6255T, ASX-312BT, ASX-612BT, SP-6305TD, GS-6401T, SRX-50XT, AU-50XT, SUH-40XT, AMH-402T

Power Tap	Impedance	Models in which tap is available
8W	1250Ω	CS-6081T, CSX-3081T, CSX-5081T, BS-6082T, PS-400T, PS-500T, BS-6083T
7.5W	1,333Ω	ASC-310T, SCM-15T, SMX-302T, OSX-66T EHC-10XT, CSD-6303T
6W	1667Ω	CS-663T, CS-662T, BS-6462T, CS-3061T, CS-5061T, PF-3B03T, WS661T, WS664T, PS-300T
5W	2,000Ω	UHC-15XT, UHC-25XT, UHC-30XT SUH-15XT, SUH-25XT, SCM-15T, ASC-20T, ASC-40T, ASC-310T, ASC-315T, ASC-320T, CS-663T, EHC-10XT, SUH-40XT, AMH-402T, CS-8151T, CSX-6101T, WSX-551T, WS-6255T, ASX-312BT, SP-5251T, SP-6305TD, GS-6401T, CSD-5201T, AU-40XT, AU-50XT
4W	2500Ω	CS-451T, CS-6081T, CSX-3081T, CSX-5081T, BS-6082T, BS-6083T, PS-400T
3W	3333Ω	CS-5061T, PF-3B03T, WS-661T, BS-6462T, CS-3061T, WS-664T, PS-300T, CS-663T, CS-662T
2.5W	4,000Ω	UHC-15XT, SUH-15XT ASC-20T, ASC-310T, ASC-315T, EHC-10XT, CSX-6101T, WSX-551T
2W	5000Ω	CS-451T, CSX-3081T, CSX-5081T, CS-6081T, BS-6082T, BS6083T
1.5W	6666Ω	CS-663T, CS-662T, BS-6462T, CS-3061T, CS-5061T, PF-3B03T, WS-661T, WS-664T, PS-300T
1.25W	8000Ω	EHC-10XT, WSX-551T
1W	10,000Ω	CS-451T

Q 30. Can I connect speakers with 100V LMT in series or series-parallel combination to the amplifier on its 100V tap?

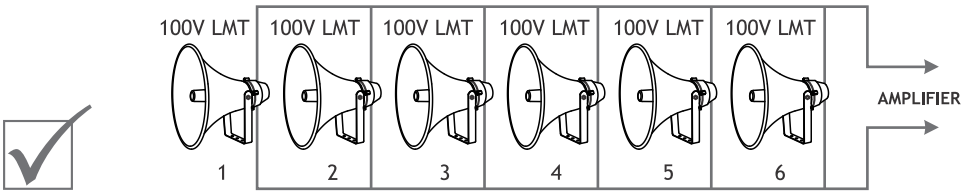
A 30.



NO! Speakers with 100V LMTs should be connected in parallel only.

Q 31. How do I connect a number of AU-40XTs to amplifier SSA-250M?

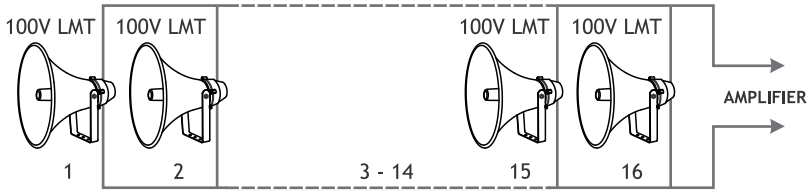
A 31. (i) Amplifier = SSA-250M (rated power output 250W RMS)
6 pcs. AU-40XT at **40W** Power Taps = 6 × 40 = 240W



(ii) Amplifier = SSA-250M (rated power output 250W RMS)
12 pcs. AU-40XT at **20W** Power Taps = 12 × 20 = 240W

(iii) Amplifier = SSA-250M (rated power output 250W RMS)
8 pcs. AU-40XT at **40W** Power Taps = 8 × 40 = 320W

(iv) Amplifier = SSA-250M (rated power output 250W RMS) 16 pcs.
AU-40XT at **20W** Power Taps = 16 × 20 = 320W



The speakers / driver units can be connected at different power taps, but the **sum total of the Power Taps should be equal to or less than the Amplifier wattage.**

Q 32. **I have understood that all speakers with 100V LMTs must be connected in parallel, the resultant impedance of the speaker group must be equal to or more than the impedance at 100V tap of the amplifier. What is the simple way of calculating the number of speakers I can connect at 100V tap of the amplifier?**

A 32. It does not matter how many speakers you connect to the amplifier. However, you must make sure that the **total sum of wattage of the Speakers Connected should be less or same as the Amplifier wattage.** If it is more than the amplifier wattage, the amplifier will get overloaded and will overheat. This will draw more current, which will damage the output transistors. The table given below gives the maximum no. of driver units that can be connected at various wattage taps to various amplifiers:

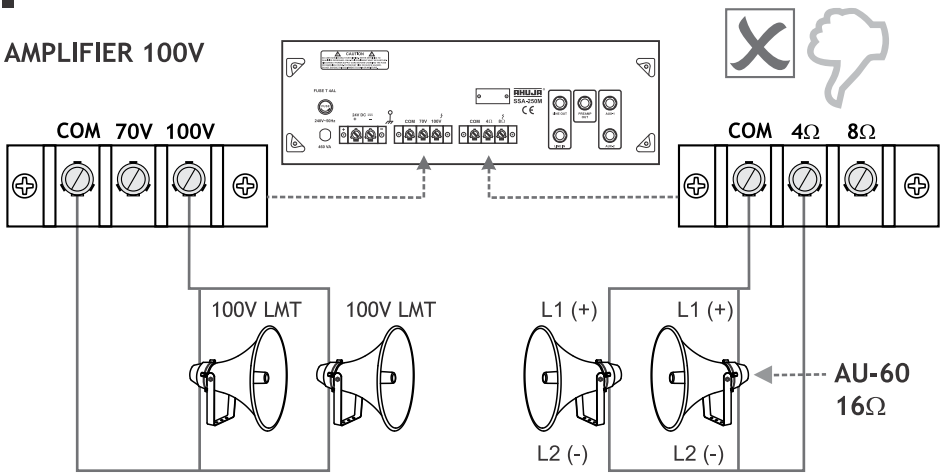
Model	At 60W Tap	At 50W Tap	At 40W Tap	At 30W Tap	At 20W Tap	At10W Tap
SSB-45EM	-	-	1	1	2	4
SSB-60EM	1	1	1	2	3	6
SSB-80M	1	1	2	2	4	8
SSA-100M	1	2	2	3	5	10
SSB-120	2	2	3	4	6	12
SSA-250M / BR-250M	4	5	6	8	12	25
AMA-240DP	5	6	7	10	15	30

Model	At 60W Tap	At 50W Tap	At 40W Tap	At 30W Tap	At 20W Tap	At10W Tap
APA-240	5	6	7	10	15	30
APA-480	10	12	15	20	30	60
SSA-5000EM /						
SPA-5000EM	8	10	12	16	25	50
TZA-1200*	1+1	1+1	1+1	2+2	3+3	6+6
TZA-1500*	1+1	1+1	1+1	2+2	3+3	7+7
TZA-2000*	1+1	2+2	2+2	3+3	5+5	10+10
TZA-4000EM*	3+3	4+4	5+5	6+6	10+10	20+20
BTZ-7000*	5+5	7+7	8+8	11+11	17+17	35+35
SPA-10000	16	20	25	33	50	100
SPA-15000	25	30	50	50	75	150

*Two zone amplifier

Q 33. Can I connect low impedance driver units / speakers to the low impedance taps and driver unit / speakers with LMT to 100V line at the same time?

A 33. We do NOT advise such connections.



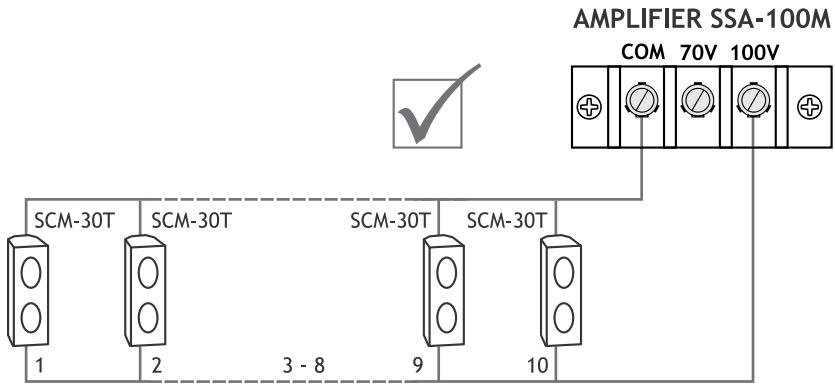
Q 34. In the answer # 28 the table shows impedance at 70V output tap. Some amplifiers have 70V tap in addition to a 100V tap. When should this tap be used?

A 34. When you have connected the correct number of speakers at the 100V tap but you find that the sound output is too high, then instead of changing the power taps of each speaker to a lower power tap, you can remove the speaker group connection from 100V output tap of the amplifier and connect it to the 70V output tap. Since the impedance at the 70V tap is half of that at 100V, the sound output will be reduced to half, but the amplifier will run safely. When a speaker / driver unit with LMT set at 15W, is connected to 100V line, it draws 15W. However, if this is connected to 70V line, it will draw only half power i.e. 7.5W.

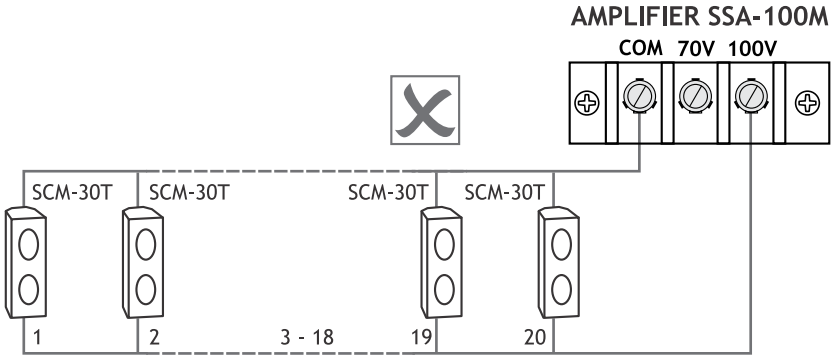
For example,

Amplifier: SSA-100M (rated power output 100W RMS)

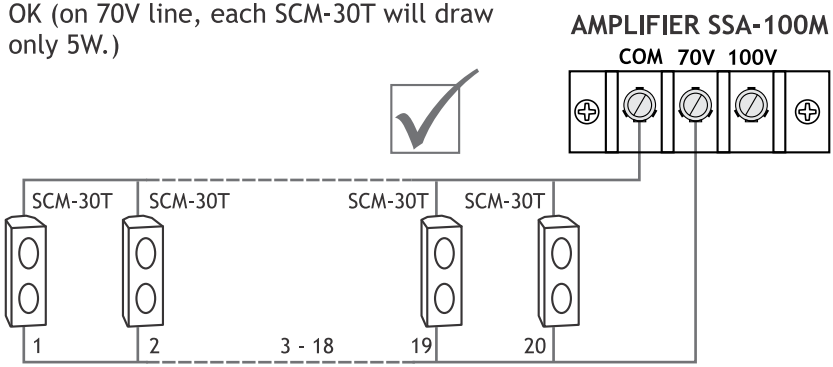
10 pcs. SCM-30T at **10W** Power Taps = 10 × 10 = 100W



Amplifier: SSA-100M (rated power output 100W RMS)
20 pcs. SCM-30T at **10W** Power Taps = 20 × 10 = 200W

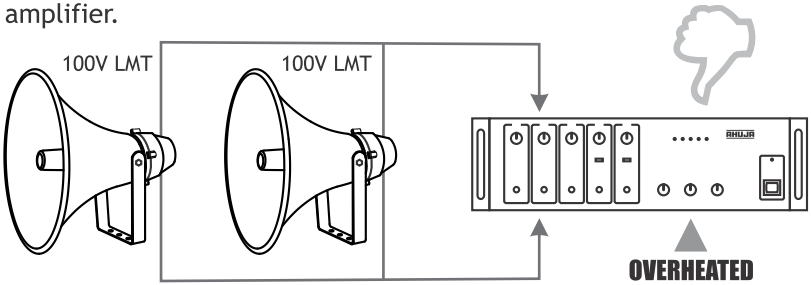


Amplifier: SSA-100M (rated power output 100W RMS)
20 pcs. SCM-30T at **10W** Power Taps = 20 × 10 = 200W
OK (on 70V line, each SCM-30T will draw only 5W.)



Q 35. How important is the quality of the LMT being used?

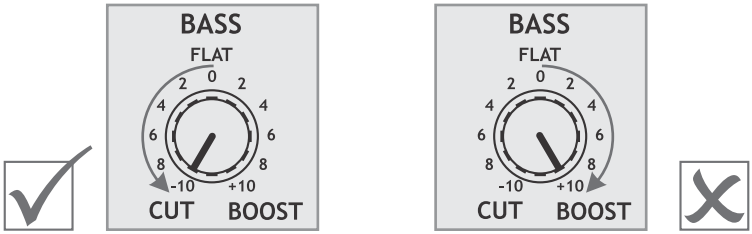
A 35. Quality of the LMT is very important. Poor quality LMT draws high current at low frequencies and overheats and damages the amplifier.



The LMT design and quality components like laminations, wires used are very important for trouble-free performance of the amplifier.

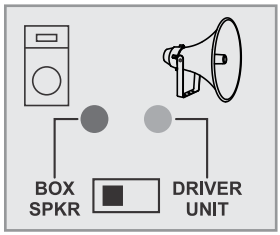
Q 36. What should be the position of bass control on the amplifier when driver units or horn speakers are connected to the amplifier?

A 36. The **BASS CONTROL should be at 'CUT' position** and never at 'boost' position as driver units do not reproduce very low frequencies and feeding **excessive low frequencies** to them can **DAMAGE the Diaphragm of the Driver Unit.**



BOX SPEAKER / DRIVER UNIT SELECTOR SWITCH:

Some Amplifiers like SSA-5000EM, SPA-5000EM, SSA-250M and SSA-160EM are provided with a 'Box Speaker / Driver Unit' Selector Switch.



Only Box Speaker can re-produce full range of frequencies to give Hi-Fi sound quality.

Driver Units and Horn Speakers give louder sound but cannot re-produce low frequencies below 200Hz. When Driver Units / Horn Speakers / Column Speakers are used, the selector switch must be kept at Driver Unit Position.

Q 37. What is the importance of phasing when connecting speakers / driver units?

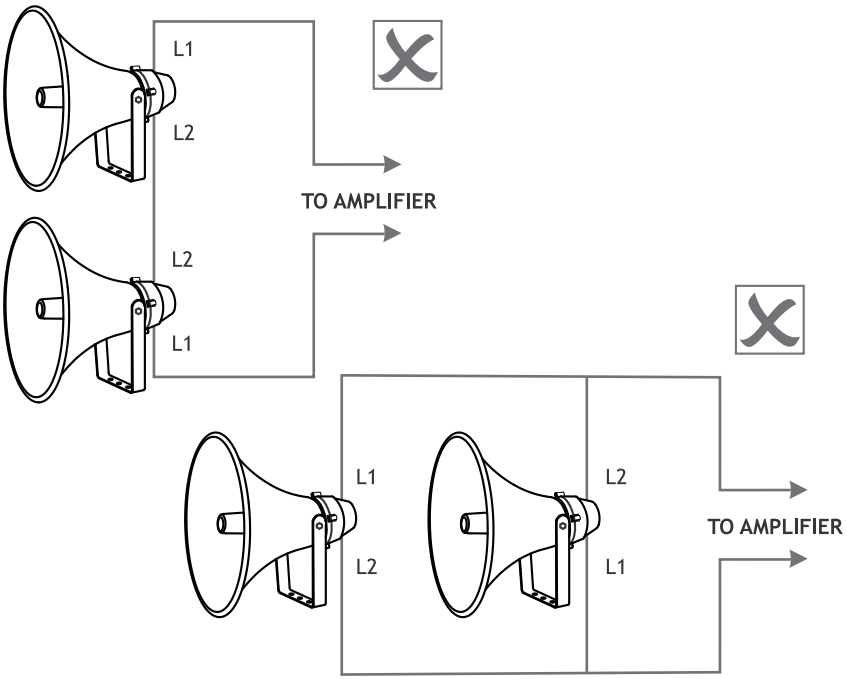
A 37. When two or more driver units / speakers are facing in the same direction and are installed in the same area, it is essential that their diaphragms / cones act in unison. Otherwise the sound level of one speaker will be canceling the sound level of the other.

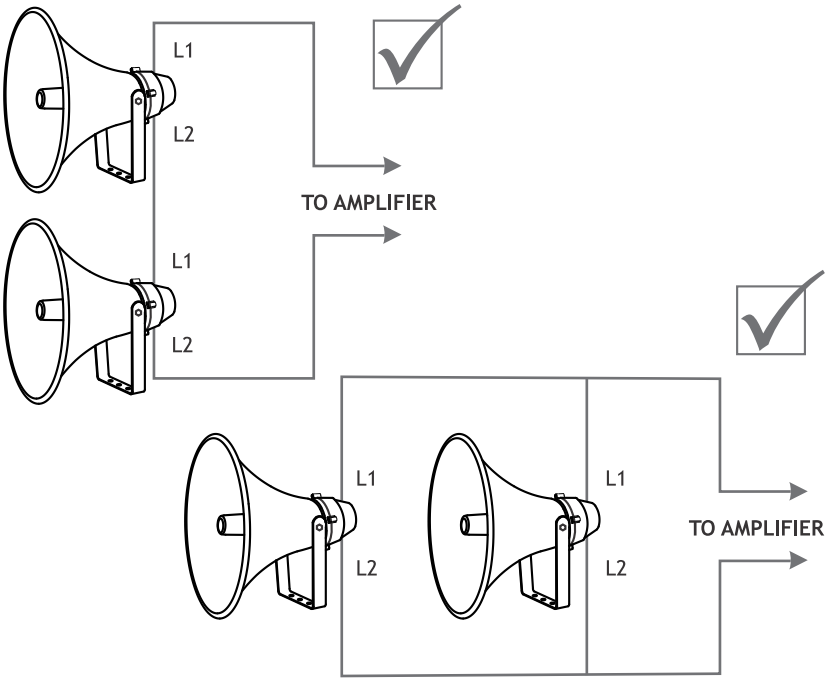
To avoid any mistake, the terminals of driver units are marked L1 and L2.

When connecting driver units in series connect L1 of one driver unit to the L2 of the other driver unit.

When connecting the driver units in parallel connect L1 of one driver unit to the L1 of the other driver unit and L2 to L2.

Diagram ▶


L1
L2
TO AMPLIFIER
L2
L1
L1
L2
L2
L1
TO AMPLIFIER


L1
L2
TO AMPLIFIER
L1
L2
L1
L2
L1
L2
TO AMPLIFIER

Q 38. Why is EARTHING of the Amplifiers so important?

A 38. Earthing or Grounding of the amplifier is very important. **Basically it connects the Amplifier METAL CHASSIS to Earth or Ground.** The chassis does not carry electric current under normal operation. But in the event of fault when a live wire carrying current comes in contact with the chassis, then this current would flow to the earth.

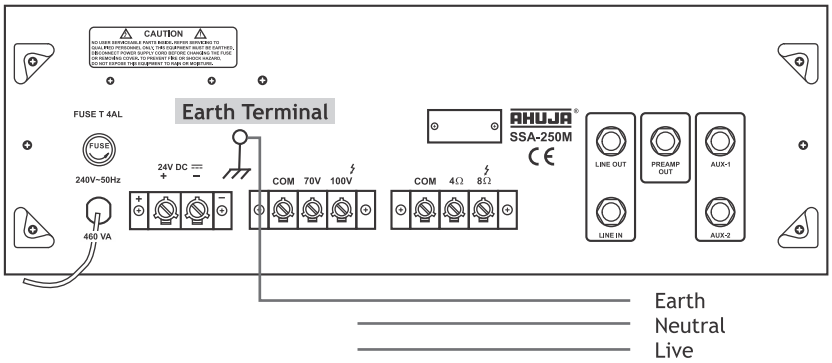
Thus Earthing provides:

- **Greater safety of the person handling the amplifier.**
- **Provides greater protection for the amplifier in case of faults.**

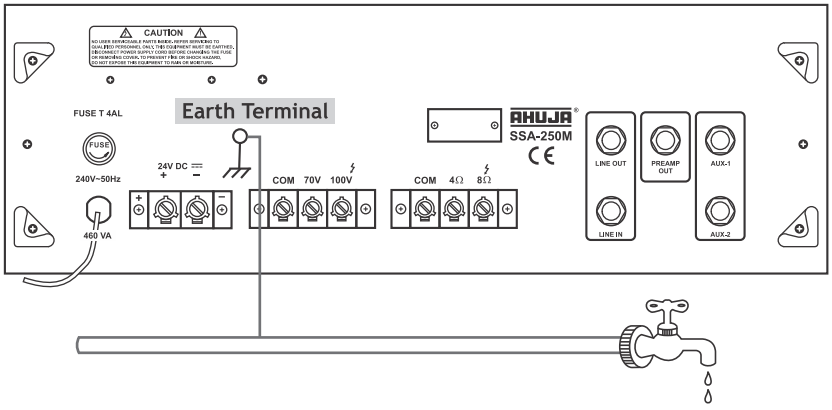
Q 39. How should we EARTH the Amplifier?

A 39. For earthing the amplifier use any one of the following methods:

(i) Connect the earth terminal of the amplifier with a wire to the electrical earth.



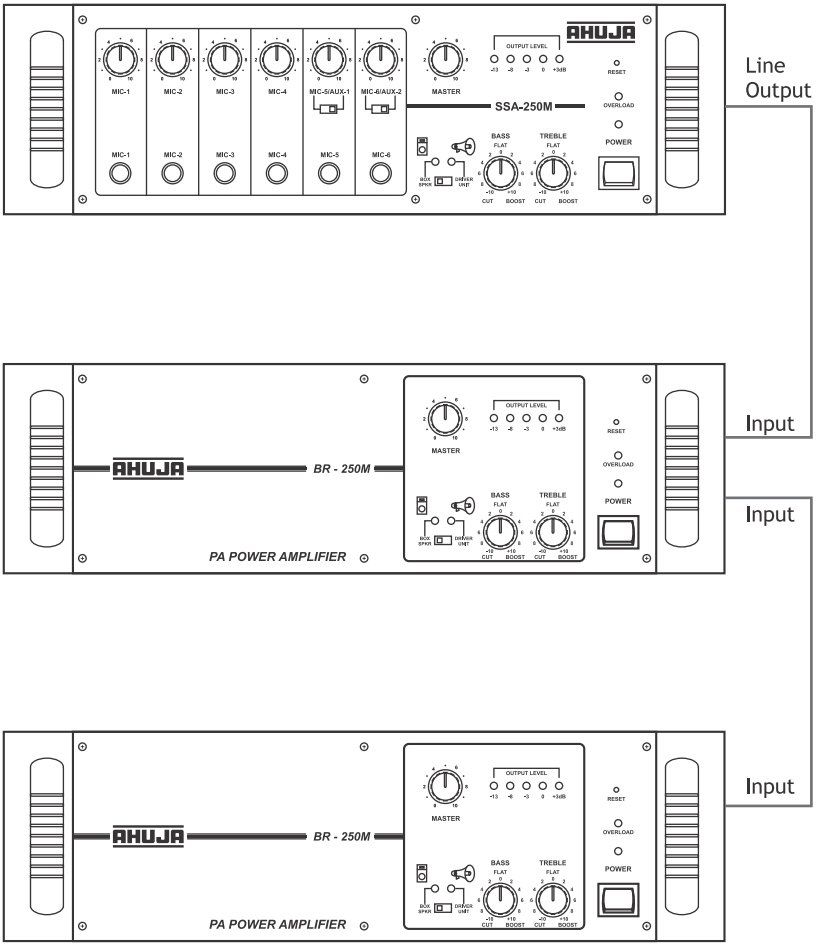
(ii) If an electrical earth socket is not available, connect the earth terminal of the amplifier with a wire to any water pipe.



Q 40. Amplifier model SSA-250M or BR-250M has 250 watts power output. If in an installation we need higher power say 750 watts, how can we connect 3 pieces, SSA-250M / BR-250M?

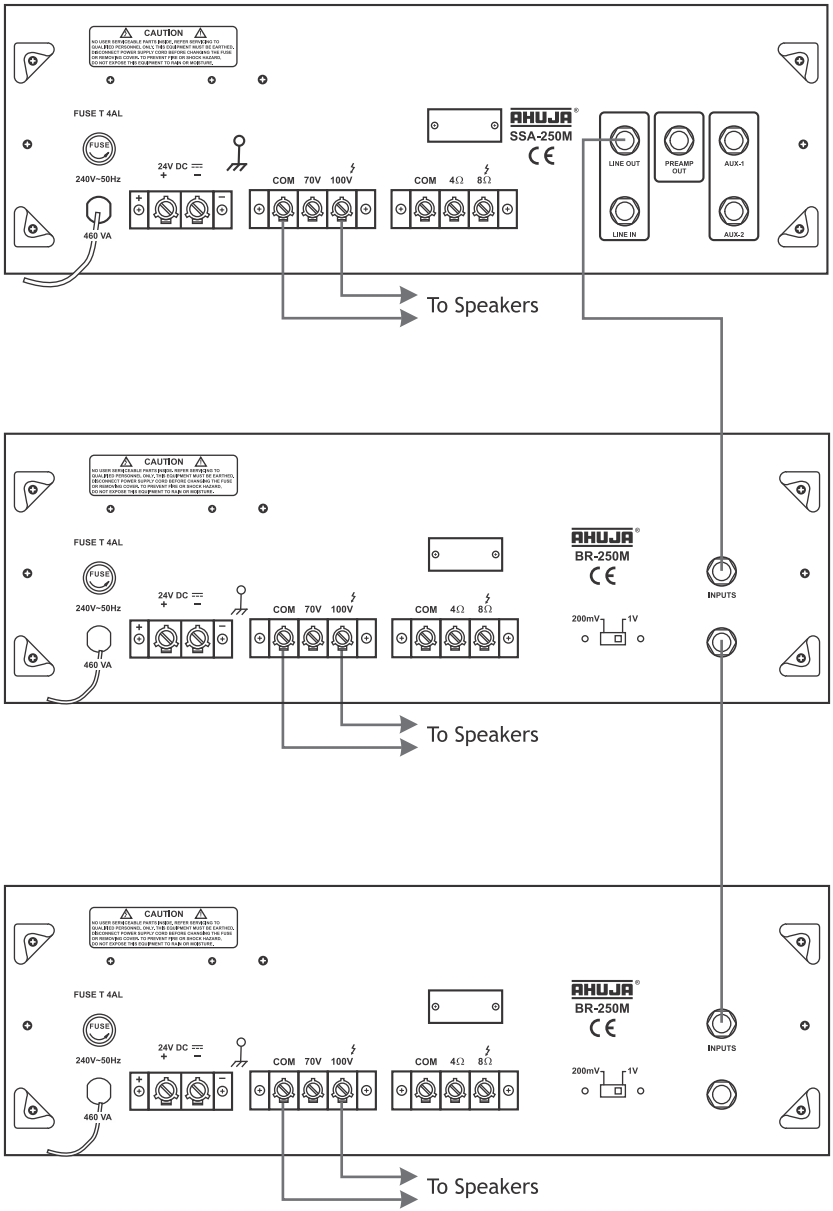
A 40. For obtaining higher power 750 watts, we can connect SSA-250M / BR-250M as shown in the diagram. Put the selector switch in BR-250M at 1V position. As both the inputs of BR-250M are in parallel, it can be connected to next BR-250M.

Similarly, a 1500 watts system can be made using SSA-5000EM / SPA-5000EM.



Q. 41. How should we connect speakers to a combination of 3 pieces, SSA-250M / BR-250M in above installation?

A 41.



Q 42. REMEMBER - When connecting a PA SYSTEM!

A 42. Important points to remember are:

(a) All the **PA Equipment** must be of **Good Quality.**

(b) All the **Cables** and **Connectors** must be of **Good Quality.**

(c) The **Resultant Impedance** of the **Speaker Group** must be calculated and should be **EQUAL TO** or **MORE THAN** the **Impedance** of the **Amplifier Output Tap,** to which the speakers are connected.

(d) In case of using **Low Impedance Speakers,** the **Total Wattage** of the **Speakers** should be **MORE THAN 30%** of the **Amplifier Rated Wattage.**

(e) When a **Large Number of Speakers** are to be connected at a **Long Distance** from the **Amplifier, Speakers with 100V LMT** should be used.

(f) When using **Speakers with 100V LMT,** all the **Speakers** should be connected in **PARALLEL.**

(g) The **Total Wattage** (Power Taps) of the **Speakers with 100V LMT** should be **EQUAL TO** or **LESS THAN** the amplifier rated wattage.

(h) The **LMTs** used should be of **Good Quality.**

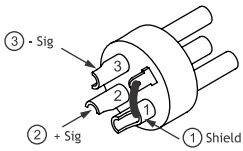
(i) The **Bass Control** of the **Amplifier** should be in **CUT Position** when **Driver Units / Horn Speakers** are used with the **Amplifier.**

(j) Always **CHECK PHASING** while connecting **Driver Units.**

(k) Always **EARTH** the **Amplifier** before operation.

Fig. 1 Input Connections - Balanced Mode

3 Pin Male XLR



6.3 mm (¼") Stereo Phone Plug

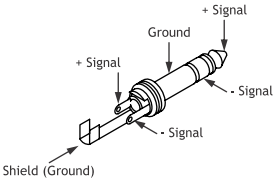
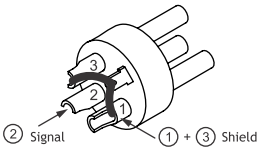


Fig. 2 Input Connections - Unbalanced Mode

3 Pin Male XLR



6.3 mm (¼") Mono Phone Plug

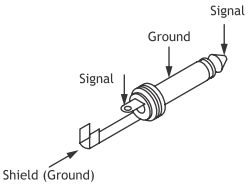
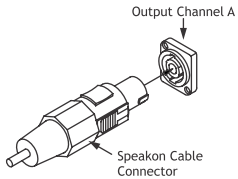
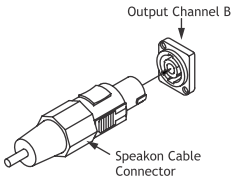


Fig. 3 Output Connections - Stereo / Mono Mode





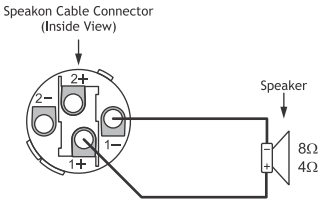
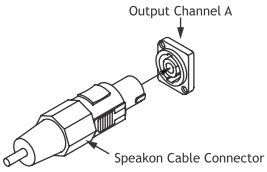
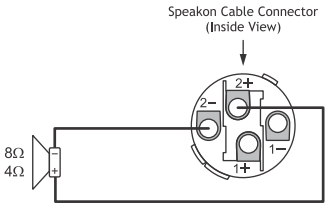


Fig. 4 Output Connections - Bridge Mode

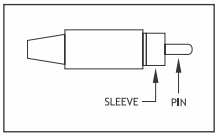




There are various connectors used with the Ahuja range of PA Products.

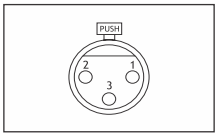
1. RCA Phono Plug

A popular audio connector used on auxiliary inputs & booster in/out connections; also commonly used on mixers, CD & tape players. They are wired using single core screened cable.



2. XLR Plug

This is the industry standard microphone connector; robust and relatively simple to install. There are a number of ways in which they can be wired.



Balanced Operation

Pin 1 connects to screen (Signal earth)
Pin 2 connects to signal + (Live)
Pin 3 connects to signal - (Return)

Quasi Balanced Operation

Pins 1 & 3 connects to the screen of the cable
Pin 2 connects to signal conductor.

The Pin numbers are identified on the XLR plug and an easy way to remember how they should be wired is:

X = Earth (Pin 1)

L = Live (Pin 2)

R = Return (Pin 3)

3. 6.3mm (¼") Phone Plug

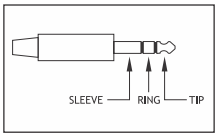
There are two versions of this connector in common use, MONO & STEREO.

The STEREO plug is used for BALANCED operation and wired as follows:

TIP - Signal +

RING - Signal -

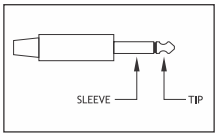
SLEEVE - Screen



The MONO plug is used for UNBALANCED operation and wired as follows:

TIP - Signal +

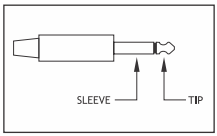
SLEEVE - Screen



The MONO plug is also used for QUASI-BALANCED operation and is wired as follows:

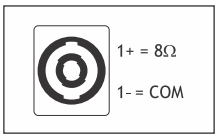
TIP - Signal +

SLEEVE - Signal -, Screen



4. SPEAKON Plug

This is used in some models of Ahuja speaker systems for connecting to an amplifier. The pin configurations are as shown in the diagram:



LOUDSPEAKER CABLE SIZE & CONNECTIONS

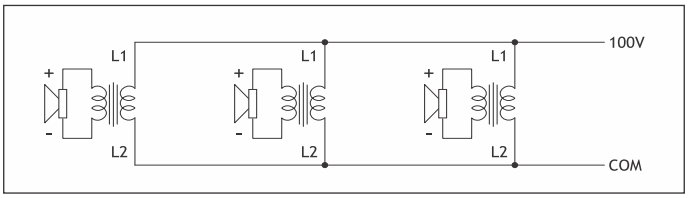
100V LINE

When installing a 100V line system, it is important that the correct size of cable is used to connect the speakers to the amplifier. The following chart gives an indication of the maximum cable length which can be used for each type of cable (cables specified by number & diameter of wire in mm).

100V Amp	24/0.2	32/0.2	48/0.2	80/0.2	128/0.2	122/0.25
30W	800m	1066m	1600m	2666m	4266m	6400m
60W	400m	533m	800m	1333m	2133m	3200m
120W	200m	266m	400m	666m	1066m	1600m
240W	100m	133m	200m	333m	533m	800m

As the voltage on the line can approach 100 volts, installation must follow best practice with double insulated cable being used. Cable runs should be kept away from any potential source of interference such as 3 phase mains, data, telecom cables etc.

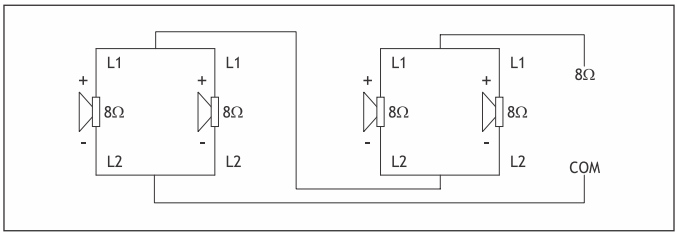
100V Line System must always be wired in PARALLEL:



NOTE: The total load presented to the amplifier must not exceed the rated output of the amplifier or damage can result.

LOW IMPEDANCE

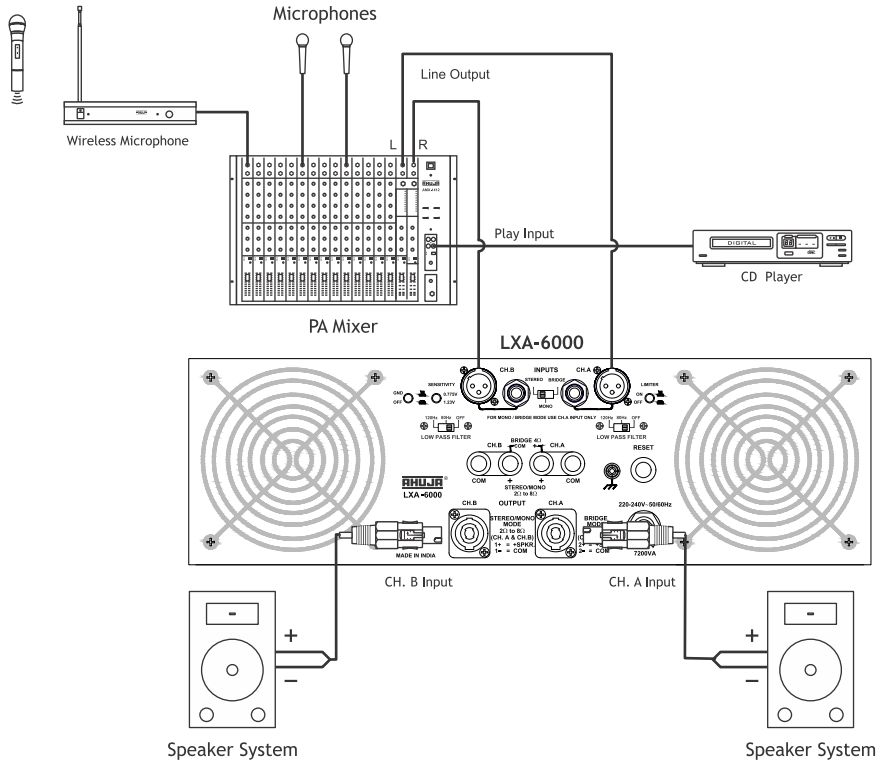
All the amplifiers in the Ahuja range have the facility for connection of low impedance loudspeakers. On low impedance, to minimize power losses, short cable runs are recommended. Where it is intended to use multiple low impedance speakers to cover an area, the speakers must be wired in a series/parallel arrangement in such a way to present the correct load to the amplifier.



NOTE: The total load impedance presented to the amplifier must never be below the rated amplifier impedance, otherwise damage can result. To avoid damage to the speakers the total wattage of the driver units should be at least 30% higher than the rated power output of the amplifier.

You must NEVER mix 100V line and low impedance speakers on the same system.

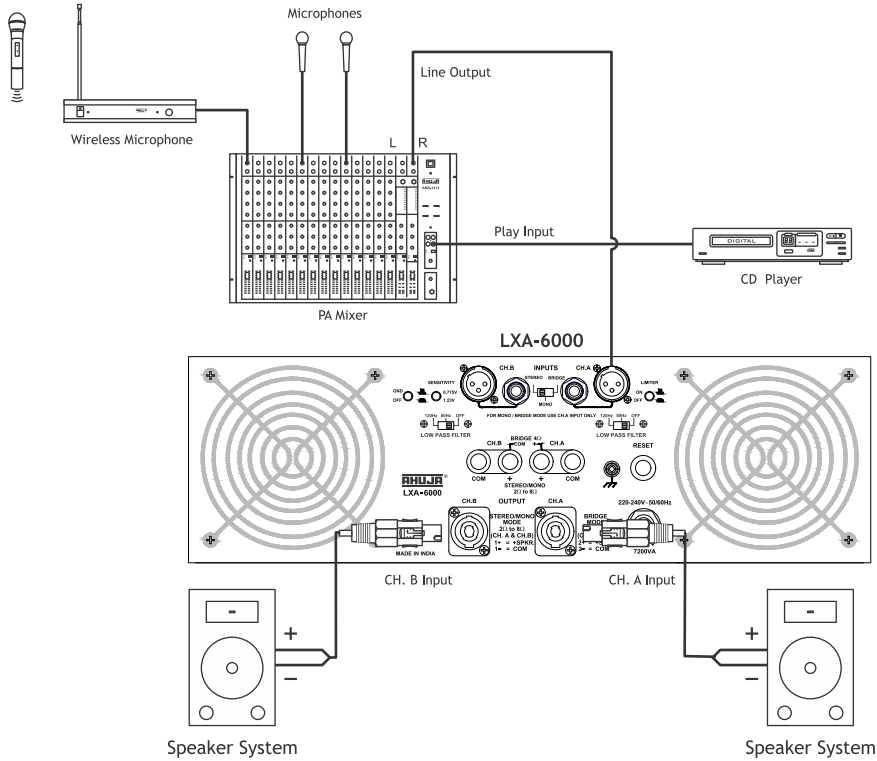
Stereo Mode Configuration



In STEREO mode, both channels A & B are fully independent of each other. The balanced / unbalanced inputs can be connected either to a stereo signal source or two independent mono signal sources. Each channel can separately drive loudspeaker loads of 8/4/2 ohms.

- Connect the Left and Right outputs of a mixer to channel A and B inputs of the amplifier respectively. Inputs can be wired as per fig. 1 & 2 *(Input Connections for Balanced and Unbalanced Mode)*.
- Connect a speaker system on the output terminal of each channel. It is recommended to use the speakon connectors and wire these as per fig. 3 *(Output Connections for Stereo / Mono Mode)*.
- To select STEREO mode, keep the slide switch, provided at rear panel, in STEREO position.
- Adjust the individual volume controls of each channel on the front panel to obtain the desired output level.
- The signal indicator LEDs glow to indicate the presence of signal at the output terminals.
- Adjust the input signal level below the threshold of clip LED glow.

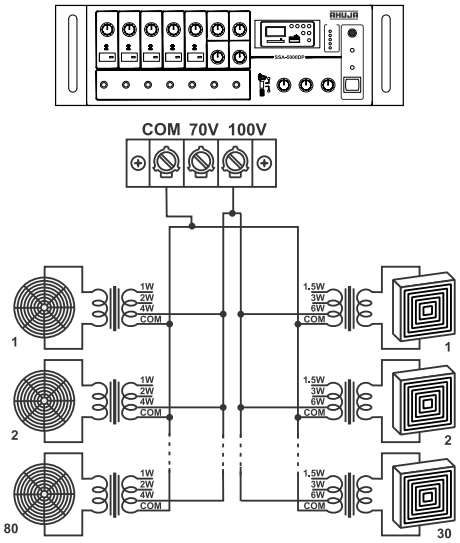
Mono Mode Configuration



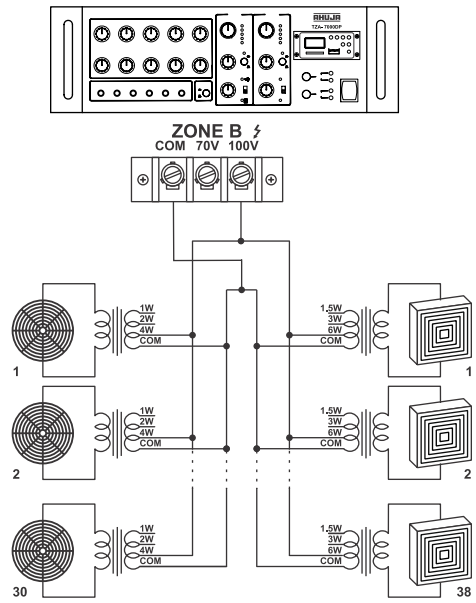
When operating in MONO mode, the signal source should be connected to the balanced / unbalanced input of **channel A only**. Both channels provide similar output to their respective loudspeakers. Each channel can separately drive loudspeaker loads of 8/4/2 ohms.

- Connect the line output of a mixer to channel A input of the amplifier. Input can be wired as per fig. 1 & 2 *(Input Connections for Balanced and Unbalanced Mode)*.
- Connect a speaker system on the output terminal of each channel. It is recommended to use the speakon connectors and wire these as per fig. 3 *(Output Connections for Stereo / Mono Mode)*.
- To select MONO mode, keep the slide switch, provided at rear panel, in MONO position.
- The desired output levels of the A & B channels are adjustable by individual control of channel A & B respectively.
- The signal indicator LEDs glow to indicate the presence of signal.
- Operate the amplifier below the onset of clip LED glow. Continuous clip LED glow may push amplifier into protect mode.

SSA-5000DP with possible combinations with wall & Ceiling Speakers



TZA-7000DP with possible combinations with wall & Ceiling Speakers



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BE VERY CAREFUL

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- Insist on seeing the AUTHORISED AHUJA DEALER CERTIFICATE with TRADE MARK AHUJA & HOLOGRAM affixed on it.
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