

SYSTEM 3400 Orator II

*V*oice *A*LRM
*S*YSTEM

Applications Manual

13499-36 Issue 1
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Preface

This first issue covers voice alarm products compatible with version 3.3X software. The manual is a guide to be read in conjunction with *BS7443 Specification for Sound system for Emergency purposes* and the recommendations in *BS5839:Part 1:1988*, which is the *code of practice for Fire detection and alarm system for buildings*. Where appropriate the site specific project specification should also be read.

Associated Documents

13499-30	Installation Manual for System 3400 Orator II
13499-34	Commissioning Manual for System 3400 Orator II
13499-32	Operating Manual for System 3400 Orator II
13499-22	Applications Manual for System 3400 (with 34000 devices)
13499-24	Commissioning Manual for System 3400 (with 34000 devices)
13499-23	Installation Manual for System 3400 (with 34000 devices)
13499-26	Operating Manual for System 3400 (with 34000 devices)
13563-011	GENT Supervisor Operator's Manual

Conventions

NOTE: A note highlights important text that is normally hidden in the main text.

CAUTION: A caution is given to prevent damage to equipment.

WARNING: A warning is given to advise of dangerous conditions that may result in injury or death.

Issue Record			
Section	Issue	Date	Comments
Prelims	1	7/97	This issue covers Application of System 3400 Orator II
1 to 19	1	7/97	
Appendix			
A-E	1	7/97	
Parts	1	7/97	
Phone			

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Customer feedback

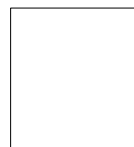
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Standards

Standards

There are a number of Standards and Codes of Practice that potentially effect the design of voice alarms. The requirements vary greatly and significantly affect the cost of a system.

When designing a system, check which standards the customer wants to use as a basis for the design. If none are stated, quote the standards used in the design offered.

Current standards

- ☐ BS 5839 Fire detection and alarm systems for buildings
 - Part 1:1988 Code of Practice for system design, installation and servicing
 - Part 4:1988 Specification for control and indicating equipment
- ☐ BS 6259:1982 Code of Practice for planning and installation of sound systems
- ☐ BS 7443: 1991 Specification for sound systems for emergency purposes
- ☐ BFPSA Code of Practice for the design, installation and servicing of voice alarm systems associated with fire detection systems (1994)
- ☐ LPS 1014 Technical Bulletin 003 Voice Alarm Systems
- ☐ LFCDA Fire Safety Guide No 3. Phased Evacuation from Office Buildings

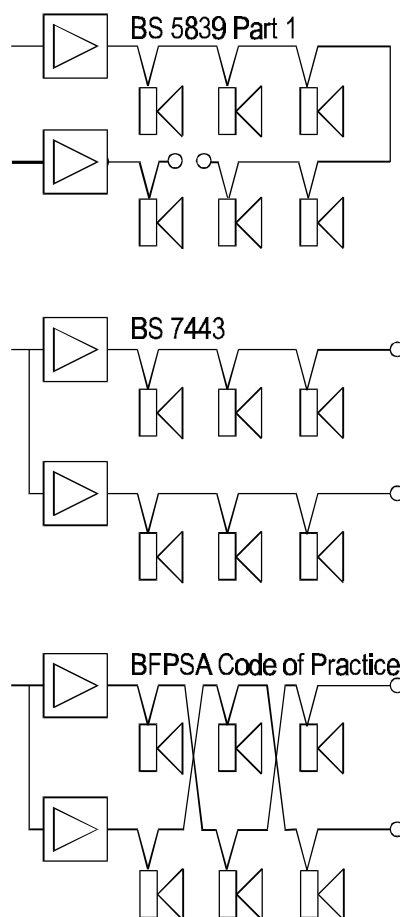
Commonly quoted standards

BS7443 and BS5839 are the two most commonly quoted standards. These are often quoted by customers.

- ☐ The difference between the requirements of single and dual loudspeaker circuits is illustrated in the following diagram together with the additional requirement for interleaving imposed by BFPSA.

Figure 1-1 Loudspeaker circuit design

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Key points about current standards

- BS5839:Part 1** Section 9.12. The UK standard was written before fire engineers had a good understanding of voice alarms. The sound levels are not really adequate to achieve good intelligibility. Aspects of fire alarm systems such as circuit monitoring, power supply and cable types are also applied to voice alarms.
- BS5839:Part 4** This UK standard applies generally to the construction quality and performance of voice alarms. The philosophy is to ensure that the standards of construction of voice alarms meets those of fire alarms.
- BS6259** Currently this UK standard covers general purpose public address systems. Although it has no direct bearing on voice alarms, it does provide useful background information about sound broadcast systems. The standard will soon be reissued in an expanded form with some references to voice alarms.
- BS7443 (IEC 849)** This standard addresses stand alone voice alarms, without any reference to associated fire alarm systems.

The 2 main technical issues are the requirements for:

- ☐ Dual loudspeaker circuits
- ☐ RASTI intelligibility level of 0.5 to be demonstrated by site testing

This standard is not well thought of within the industry and is being revised.

BFPSA Code of Practice

This code of practice has been prepared to fill the gaps left by BS5839:Part 1 and BS7443. It will form the basis of BS5839:Part 8.

The code of practice recommends dual circuit loudspeakers, as per BS 7443, but does allow relaxation in certain lower risk situations (Section 5.6).

LPS1014

This bulletin is intended to clarify the LPCB interpretation of various fire detection and alarm codes of practice. It requires loudspeaker circuits to be treated in the same way that sounder circuits are in BS5839 Part 1. This means that loudspeakers should be monitored for removal and that there should be one loudspeaker circuit per zone.

The bulletin acknowledges the BFPSA code of practice and BS7443.

LFCD A

This covers specific types of building in inner London. It specifies additional power supply requirements and suggests standard voice messages.

Terminology

Voice alarm system: A monitored audio system that provides means for broadcasting warning signals and live recorded speech messages in a fire alarm emergency situation.

Loudspeaker Zone: Any part of the area of coverage to which information can be broadcast individually.

Firemans microphone: A microphone dedicated for use by the Fiire Brigade or other responsible persons as part of the voice alarm system.

Intelligibility: A measure of the proportion of the content of a speech message that can be correctly understood. Satisfactory intelligibility requires adequate audibility and adequate clarity.

Clarity : The property of a sound which allows its information-bearing components to be identified by the listener.

Audibility : The property of a sound which allows it to be heard among other sounds.

VA : Voice Alarm

PA : Public Address

CSR : Central System Rack (*Not covered in this manual*)

PTT : Press to Talk

E²PROM : Electrically Erasable Programmable Read Only Memory

DAU : Distributed Amplifier Unit

ACU : Audio Control Unit

DTMF : Dual Tone Multi-Frequency

FPGA : Field Programmable Gate Array

SPL : Sound Pressure Level

STI : Speech Transmission Index

RASTI : Rapid Assessment of Speech Transmission Index

Voice alarm applications

Airports, railway stations, passenger termini

Environment The environment is characterised by high background noise covering a broad range of frequencies. The reverberation time is likely to be very high.

The size of the area to be covered may mean that a number of loudspeakers have to be sited at regular intervals.

Sound requirements The prime requirement will be for public address announcements, background music is unlikely. Airports and passenger termini are likely to require a number of inputs.

All will require zoning, railway stations probably will require zoning by platform.

Hotels, restaurants, clubs

Environment Often the environment will include a reasonable amount of soft furnishing that will help improve the acoustic quality of the building.

Sound requirements Both background music and announcements will be required. Be aware of any expectation that the system could also be used for live reinforcement of a local performance, ie foreground music.

All may require zoning, especially between staff and customer areas.

Factories, offices, canteens, department stores

Environment The environment is often characterised by high background noise and also long reverberation times.

Sound requirements Both background music and announcements will be required. If instructions are to be announced over the system it will probably require zoning.

Indoor sports stadia, swimming pools, exhibition halls

Environment The ambient noise levels are likely to vary, sometimes being very high, often due to spectators. Reverberation times are often excessive and acoustics generally poor. Ice rinks, in particular, have very poor acoustic qualities and should be zoned separately.

Sound requirements Arena and pool areas will probably require separate zoning. Exhibition halls often require local microphone inputs.

Theatres, concert halls, opera houses

Environment It is often necessary to conceal the loudspeakers. The acoustic qualities of the building together with the required sound quality demand that the advice of a specialist is sought.

Sound requirements Although most large productions will use a dedicated sound system, there is normally a requirement for the building to have its own high power, high quality system. Often the system is used for the reproduction of sound effects or off-stage choruses.

Paging may be required during rehearsals. Voice alarm systems are normally suppressed in the main auditorium during public performances to prevent panic.

Conference centres

Environment Environments vary greatly.

Sound requirements These venues are often used for other events such as lectures, sales presentations and small musical shows. A flexible, good quality sound system is required to suit these needs. Specialist services such as interpretation facilities are normally provided by hire companies for specific events.

Discotheques

Sound requirements The sound reproduction equipment required for a discotheque is specialist and cannot be provided by a voice alarm system. However, there may be a requirement for such a system to be overridden in the case of fire so that a voice alarm may be heard.

✓ = required † = may be required

Building	Background music	Paging	Emergency announce	Tones (not fire)	Quality recorded program	Assistive hearing
Airport		✓	✓			✓
Auditorium		Rehearsal only	✓		✓	✓
Canteen	✓	✓	✓	†	†	†
Club	✓		✓		✓	✓
Concert Hall		Rehearsal only	✓		✓	✓
Council chamber			✓			†
Court building		†	✓			
Court room			✓			†
Conference room	Public areas		✓	†	✓	✓
Department store	†	†	✓			
Factory	†	✓	✓	✓		In noisy areas
Hospital		public area only	✓	†		
Hotel	✓	✓	✓		†	†
Lecture theatre		External areas only	✓		✓	✓
Office		✓	✓	†		
Passenger terminal	†	✓	✓			✓
Railway station	†	✓	✓			✓
Restaurant	✓	†	†			
University/School		✓	✓	✓		May have specialist system
Shopping precinct	✓	✓	✓			†
Sports stadium (indoor)	✓	✓	✓	†	✓	†
Swimming pool	✓	✓	✓	✓	†	
Leisure centre	✓	✓	✓	✓	†	†
Theatre - public area	✓	✓	✓	✓	✓	May have specialist system
Exhibition hall	✓	✓	✓		†	✓
Ice ring	✓	✓	✓	✓	✓	†
Plant room		✓	✓	†		†
Museum / Art gallery		✓	✓		✓	✓

Table 2-1 Voice alarm/ PA requirements in buildings

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3400-Orator II System overview

The 3400-Orator II public address and voice alarm system has been designed to integrate with the GENT System 3400 and to meet requirements of BS7443 and BS5839:Part 1.

The general features of the voice alarm being duplication of the power amplifiers and loudspeaker circuits for each broadcast zone, critical signal path monitoring and battery support of twenty four hours quiescent with thirty minutes in evacuate condition.

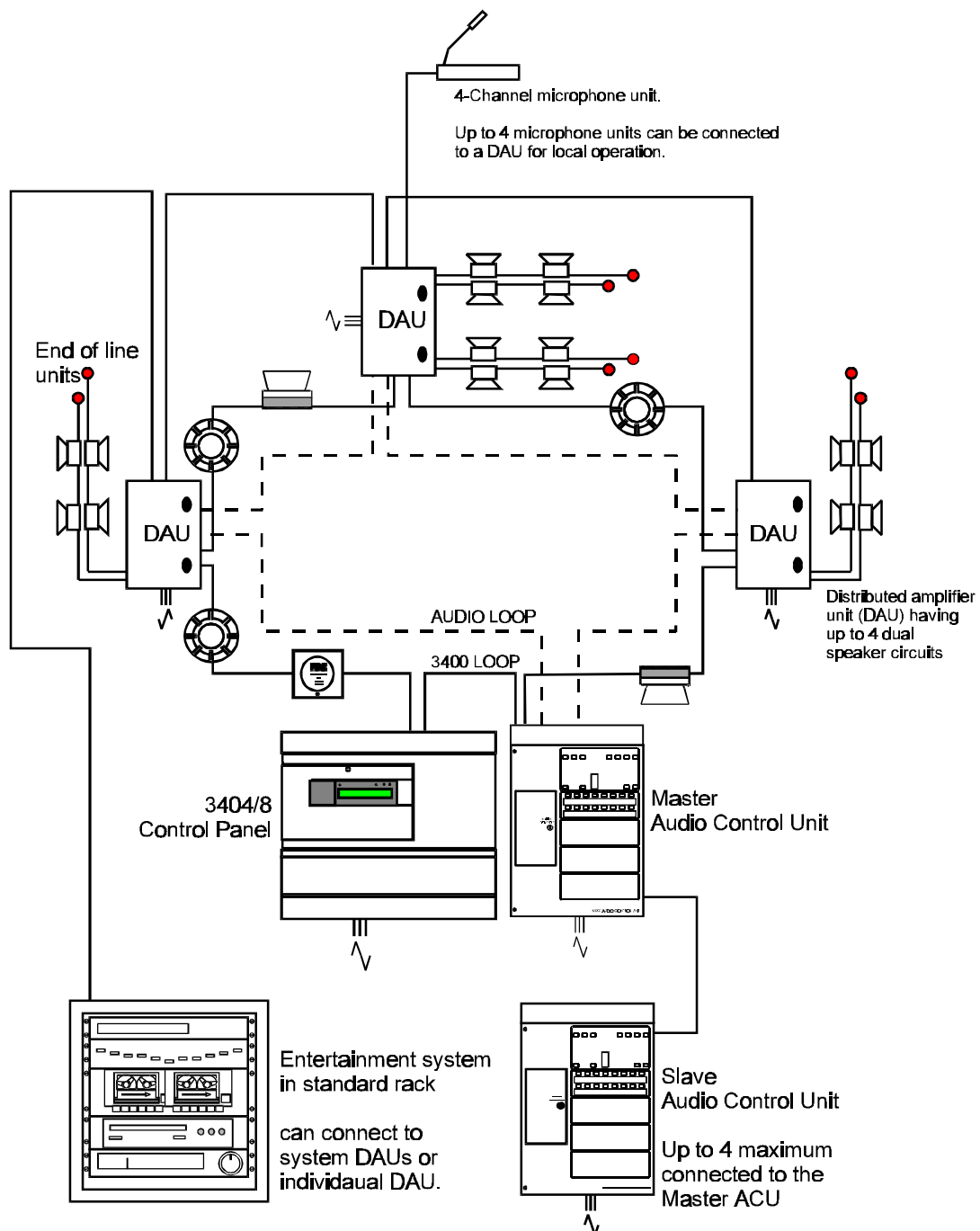


Figure 3-1 Typical system 3400 Orator II
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	The design of Orator II is based on a distributed audio philosophy with integration into the Gent fire detection system.
Components	<p>The main components of 3400-Orator II system are:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Audio control unit (ACU) <input type="checkbox"/> and Distributed Amplifier Units (DAUs) <input type="checkbox"/> loudspeakers
Features	<p>As standard the system can have:</p> <ul style="list-style-type: none"> <input type="checkbox"/> a maximum of eight 100 Volt line outputs channels per DAU to make four zones. <input type="checkbox"/> to allow broadcast of live speech selectable from the ACU directed to up to 64 zones. <input type="checkbox"/> with pre-recorded messages under the control of the Gent 3400 fire control panel.
Distributed design benefits	The distributed design philosophy allows a DAU to be placed in the same area to be covered by audio broadcasts thus optimising installation of loudspeaker circuits, keeping these circuits to a minimum length for operational integrity and efficiency.
Integrated System	The 3400-Orator II system facilitates distribution of live emergency speech, recorded messages or low priority speech and background music.
Connection	The 3400-Orator II system can be interconnected via one or two loop circuits. The first loop circuit called the 3400-loop is controlled by the Gent 3400 fire panel, where one or more DAUs are connected to the loop. The second loop circuit is the audio loop connected to the master ACU .
Messages	Non volatile prerecorded messages of Evacuate and Alert resident in the DAU are then under the control of the fire detection system which is responsible for the cause and effects. This allows flexibility in programming via the fire panel without the need for adjustments to the voice alarm system.
Optional Local microphone at DAU	A distributed amplifier unit with local microphone provides a source of live speech local only to that DAU zones, it can select any or all of the four zones covered by the DAU. Up to four 4-zone microphone can be connected to a single DAU.
Optional entertainment system	Background music can be broadcast to DAU zones via an entertainment system.
Audio network loop	With the introduction of an ACU, live speech announcements can be made to any or all DAUs.

Notes to Designer

- BSPSA** ☐ The difference between the requirements of single and dual loudspeaker circuits is illustrated in the following diagram together with the additional requirement for interleaving imposed by BFPSA.

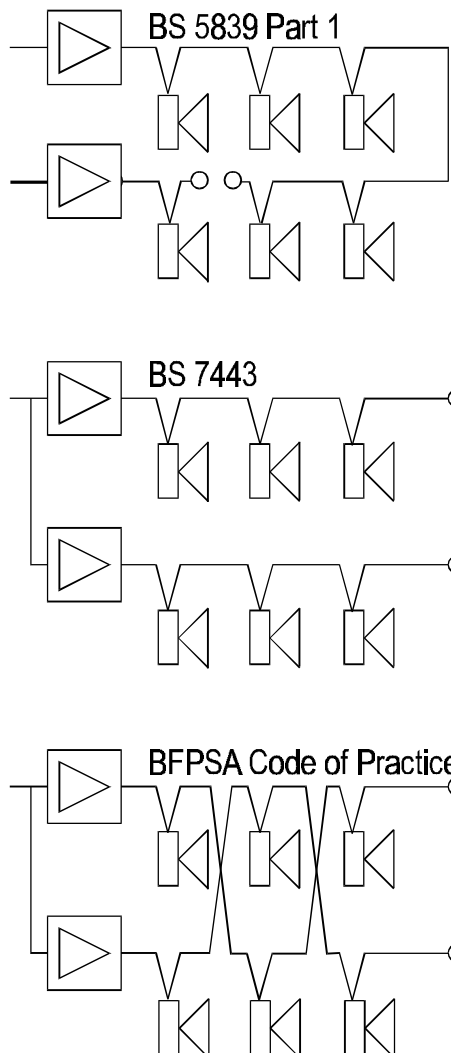


Figure 4-1
Loudspeaker circuit
design

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- BS7443** ☐ One of the major differences is that BS7443 requires dual loudspeaker circuits. This requires additional amplifiers and housings as well as more complicated wiring.
- Intelligibility** ☐ Orator installations are designed to provide a minimum speech transmission index (STI) of 0.45. Intelligibility of the system is dependant on:
- sound level
 - noise level
 - reverberation

The greater the ratio of direct sound reaching the listener compared to reverberated sound and noise, the more intelligible the speech will be.

Sound levels

- ☐ Orator systems are designed to provide a minimum sound level 10 dB above the background noise level. The maximum variation in sound levels, between the quietest and loudest locations is designed to be 10 dB. Thus in some locations the sound level will be 10 dB above the background noise and in others 20 dB above.

Noise measure

- ☐ The background noise level may be measured using an appropriate sound pressure level instrument. Alternatively the background noise may be predicted from figures published in British standards and other authoritative sources.

Noise allowance

- ☐ In some installations the background noise will increase when a fire is detected. The increased noise levels should be taken into account when designing the voice alarm system. Examples:
- ventilation equipment is automatically switched on to clear smoke
 - traditional fire alarm sounders are used in adjacent areas, but should be avoided.

Background music

- ☐ Background music is often used in shops and restaurants to provide ambiance. It should not interfere with normal conversation. The sound level of background music will depend on:

- Background noise level
- Environment

A typical level of background music in a busy shopping environment would be 60 to 65 dB(A). Background music should not be confused with foreground music employed for the playing of music as primary entertainment such as concerts.

Interference

- ☐ The sound level in the vicinity of the microphone, if used, must be low to avoid acoustic feed-back and 'howling'. The background noise level in this vicinity should also be low, less than 40 dB(A).

NOTE: *Avoid siting voice alarm speakers close to microphone.*

Loudspeaker cable

- ☐ Loudspeaker cables for use in voice alarm systems need to allow prolonged operation in a fire and are treated as sounder cables would be in BS5839:Part 1:1988.

Ceiling Loudspeaker

- ☐ Ceiling loudspeakers, sited in suspended ceilings, are always fitted with a metal fire-dome which has two purposes, one is to help maintain the fire rating of the ceiling, so that fire and smoke cannot spread into ceiling voids and into other areas of the building, the second purpose is to provide a rigid fixing for cable termination's, in a similar manner to cabinet loudspeakers.

- | | |
|---------------------------------|--|
| Loudspeaker construction | <input type="checkbox"/> The standard loudspeakers for use in the voice alarm, generally have metal cabinets so that a degree of mechanical strength is maintained at high temperatures. While the loudspeaker itself may fail at a relatively low temperature in a fire situation, it is important that the loudspeaker wiring is maintained intact for a more prolonged period so that other units further down the circuit are not disabled, the cabinet supports the cable glands and termination's and must remain rigid to help circuit integrity. Wooden or thermoplastic cabinets would be vulnerable in a fire. |
| Loudspeaker tap | <input type="checkbox"/> The <i>as fitted drawings</i> should state the required loudspeaker tapping, particularly if it is different from the factory supplied setting. The exact tapping available will depend on the loudspeaker used. The contractor will therefore need information on loudspeaker tap settings before installation. |
| End-of-line | <input type="checkbox"/> The loudspeaker circuits are wired radial with EOL monitor units. The circuits should be wired in a cable that provides two cores plus a conductive sheath, such as MICC. The sheath is used to return the monitoring signal. It is possible to use an earth return rather than the cable sheath, but care must be taken to avoid earth loops.. |
| Connection | <input type="checkbox"/> Connections to loudspeakers need to be made using IN & OUT connections so that removal of a loudspeaker will open circuit the line and cause a fault indication to be given. (This is similar to the conventional sounder monitoring required by BS 5839:Part 1:1988). |
| Mounting | <input type="checkbox"/> In some cases, loudspeakers fitted on adjustable mounts such as horns or column units will require the final connection to be made using a cable with some flexibility, with the main circuit made off into a junction box. |
| Flexible cable | <input type="checkbox"/> The flexible cable from the junction box to the loudspeaker should be fire rated, this could be a cable such as Firetuf or Radox, but the cross sectional area should be at least the same as the main circuit to avoid voltage drop. |
| Upgrades | <input type="checkbox"/> It is vital that any system design offered meets the appropriate specification as the cost of upgrading is very high. Conversely the additional cost of dual loudspeaker circuits when only single circuits are required is likely to be not competitive. |

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Cable Types

Cables

The cable is an important part of the 3400 Orator fire alarm system, which carries both communication data and power supplies. Its integrity is therefore essential for fire detection and alarm signals to be processed to keep the system operational.

Circuits

The cable for use on the:

- 3400 loop
- Audio loop
- Between ACUs (master and slave) - Audio control and data
makes use of 3 off 2-core cables
- Loudspeaker circuit

Cable use

- ☐ Typically **1Km** per circuit.
The Audio loop may exceed 1Km.

Cable type and Specification

- ☐ **Mineral insulated copper cable** (EMC Compliant)

- The cable is to *BS6207: Part 1*
- fire resistance tested to *BS6387 categories CWZ*
- having continuous metal sheath encapsulation
- no more than 2- cores
- each core having **1.5mm²** cross section area
- a **red** cover sheath (preferred for alarm applications)
- core to core capacitance **190pF/m**
- core to screen capacitance **220pF/m**

- ☐ **Delta Crompton FTZ2E1.5 FireTuf OHLS fire resistant cable**
(EMC Compliant)

- two core plus earth wire
- fire resistance tested to *BS6387 categories CWZ*
- each wire having **1.5mm²** cross section area
- core to core capacitance **115pF/m**
- core to screen capacitance **205pF/m**

NOTE: Multicore cables having more than 2-cores **are not allowed** for loop wiring, due to inadequate separation and possible electrical interference problems.

Alternative cable

CAUTION: In countries where the **European EMC directive** is in force, **only** those cables detailed in the **EMC Compliance** part of this manual may be used.

Alternative cable types which may be acceptable providing:

- ☐ The cable is to *BS6387* having
- ☐ typically no more than **1Km** cable usage per loop circuit
- ☐ no more than **2 - cores**
- ☐ a maximum of **0.5uF** intercore capacitance
- ☐ a maximum of **13** ohms per core
- ☐ each core having no less than **1.5mm²** cross section area
- ☐ with an inherent or through metal conduit screen for earth continuity in order to produce electrical protection and screening
- ☐ having protection from heat and mechanical damage
- ☐ the cable screen must be capable of being earthed at each system device (outstation)

Microphone cable

The local microphone that connects to a DAU.

- Cable length** ☐ A maximum of **500m** cable length between DAU and microphone may be used.
- Cable type** ☐ **Firemans microphone** cable should be as per loop cable
- ☐ **PA Microphone** may be a 6-core with outer screen of 0.5mm² per core.

Siting equipment and wiring

Siting Control equipment

- | | |
|------------------------------------|--|
| Audio control unit (Master) | <input type="checkbox"/> The master audio control unit must be mounted next to the 3404/8 Fire alarm control panel. |
| Audio control unit (Slave) | <input type="checkbox"/> The slave audio control unit must be mounted next to a 3450 Fire alarm repeat panel. |
| Distributed amplifier unit | <input type="checkbox"/> The distributed amplifier units should be located in or as close as possible to the zonal areas it broadcasts to via loudspeaker circuits. |
| Entertainment system | <input type="checkbox"/> Entertainment systems are usually located in reception areas. |
| 4 - Microphone unit | <input type="checkbox"/> This unit is used for Fire/PA announcement in the respective amplifier zones. It is usually located in an office type of environment. Up to four units can be connected to a DAU. |
| Loudspeaker siting | <input type="checkbox"/> See section on setting and siting loudspeakers |

System wiring

See the installation manual for details.

- | | |
|----------------------------------|---|
| Installation requirements | <input type="checkbox"/> It is recommended that the installer follow the general requirements of <i>BS5839:Part 1:1988</i> , which is the <i>code of practice relating to the fire detection and alarm systems for buildings</i> and <i>BS7443:1991 Specification for sound systems for emergency purposes</i> . The relevant parts of the <i>BS7671:1992 Requirements for Electrical Installation Institute of Electrical Engineers Wiring Regulations 16th edition</i> must also be followed. |
| Second fix installation | <input type="checkbox"/> To prevent the possibility of damage or dirt degrading the performance or appearance of the System 3400-Orator II products, the installation of second fix items should be delayed until all major building work in the area is complete. |
| Fixture and fittings | <input type="checkbox"/> It is the installers responsibility to provide adequate fixtures and fittings for the type of construction surface onto which a product is to be installed, whilst utilising the fixing points on the respective product. As an aid to this decision, the weight and overall size of each full assembly together with implications on cable entries and routing should be taken into consideration. |

As fitted drawings

- ☐ The installer should acquire site specific information from the interested parties, for details on the location of products for installation. The acquired information together with the installation manual and relevant standards should be used to assist the installation work.

Loudspeaker Uses

Refer to product data sheets and parts list.

Ceiling loudspeakers

Ceiling loudspeakers normally consist of a moving-coil direct radiator unit (Orator ceiling loudspeakers include a closed back). Sometimes a device is included to widen the spread of sound, this characteristic is particularly important at higher frequencies.

Orator loudspeakers are fitted with a metal fire dome to:

- Maintain the fire rating of the ceiling so that fire and smoke cannot spread into ceiling voids and into other areas of the building.
- Provide a rigid fixing for cable termination's, in a similar way to the enclosures of cabinet loudspeakers.

Cabinet loudspeakers

Cabinet loudspeakers normally contain one or more moving-coil direct radiator units mounted in an enclosure. Small types are used for local low level sound reinforcement and paging. Larger types may include horn loaded midrange and high frequency units suitable for higher power reproduction of music.

Bi-directional loudspeaker

A bi-directional loudspeaker comprises either 2 loudspeakers facing opposite directions in the same enclosure, or a single loudspeaker with appropriate baffling and apertures to provide sound in 2 opposite directions.

Theses are often used in corridors and may be fixed to a wall, ceiling or suspended on wires.

There is normally a quiet spot directly below the loudspeaker, this may not be important if occupants would normally be passing through such a spot fairly quickly.

Re-entrant horn loudspeaker

A re-entrant horn is basically an exponential horn loudspeaker with a folded horn. This provides a more compact unit but does introduce some distortion.

These loudspeakers may be characterised as cheap, high power and coarse but they may provide adequate reproduction if the application is designed carefully. They are often used for speech only systems and often out of doors. Without special precautions they may be damaged by music reproduction.

Column or 'line-source' loudspeakers

A column loudspeaker is effectively a cabinet speaker with a column or line of drive units. This type of loudspeaker can produce a wide angle of radiation along one axis and a narrow angle of radiation along the other axis. The greater the number of drive units the narrower the narrow angle will be.

Because of the narrow beams it is important to carefully align the loudspeakers. If repeater units are used for example to cover a long church the loudspeakers should be adequately spaced (12 to 15 metres) or use signal delay lines.

Loudspeaker Zone

How to determine loudspeaker Zonal area

Zone The recommendations for zoning areas in buildings are given in BS5839:Part 1:1988.

Loudspeaker zones are determined in a similar manner to sounder zones and correspond to particular areas of a building to which information can be broadcast individually.

Just as for alarm sounder sectors, loudspeaker zone boundaries should coincide with fire alarm detection zone boundaries. It is also permissible to have several detection zones in one loudspeaker zone.

BS7443 In systems complying to BS 7443 it will be necessary to run two loudspeaker circuits in each area. The aim behind the two circuits is to maintain audibility as far as is possible should one circuit of loudspeaker fail, due to either a wiring or an amplifier fault. The intention is that each adjacent loudspeaker is fitted to an alternate circuit. In practice loudspeakers in a corridor may be on one circuit and those in adjacent offices on another. The loudspeaker load in a zone should be split equally between the two circuits.

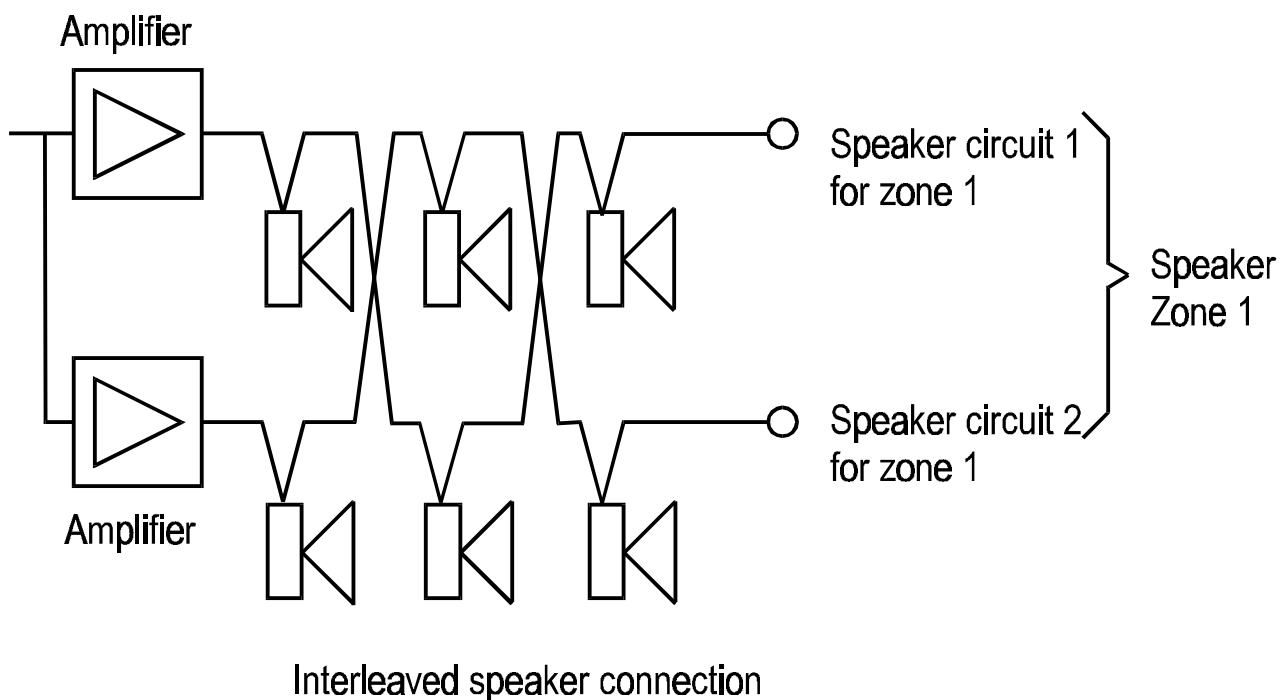


Figure 8-1 Interleaved speaker circuits
cdm150

Complex zonal requirements with PA

The situation may become more complex if the system is used for both Voice Alarm and public address as the two uses may have different zoning requirements.

An example would be in commercial premises, where a whole zone might require to receive an Evacuation signal, but the Directors offices would not wish to hear and be disturbed by regular low priority messages such as staff location broadcasts.

Similarly in retail premises an evacuation zone might have areas where routine calls could be made only into staff areas and advertising messages only into public areas. In some cases this may lead to a loudspeaker zone being covered by several pairs of loudspeaker circuits to provide the flexibility required.

In some cases only part of the zone cabling might be used for non-emergency messages, while the whole circuit could be used for emergency messages.

Distributed Amplifier Unit (DAU)

Each DAU is allocated a unique address (1-16) which is accessed from the audio control unit (ACU). The maximum number addressable DAUs per Orator II system is 16. With each DAU capable of 4 zones the maximum number of zones per Orator II system is $16 \times 4 = 64$ zones.

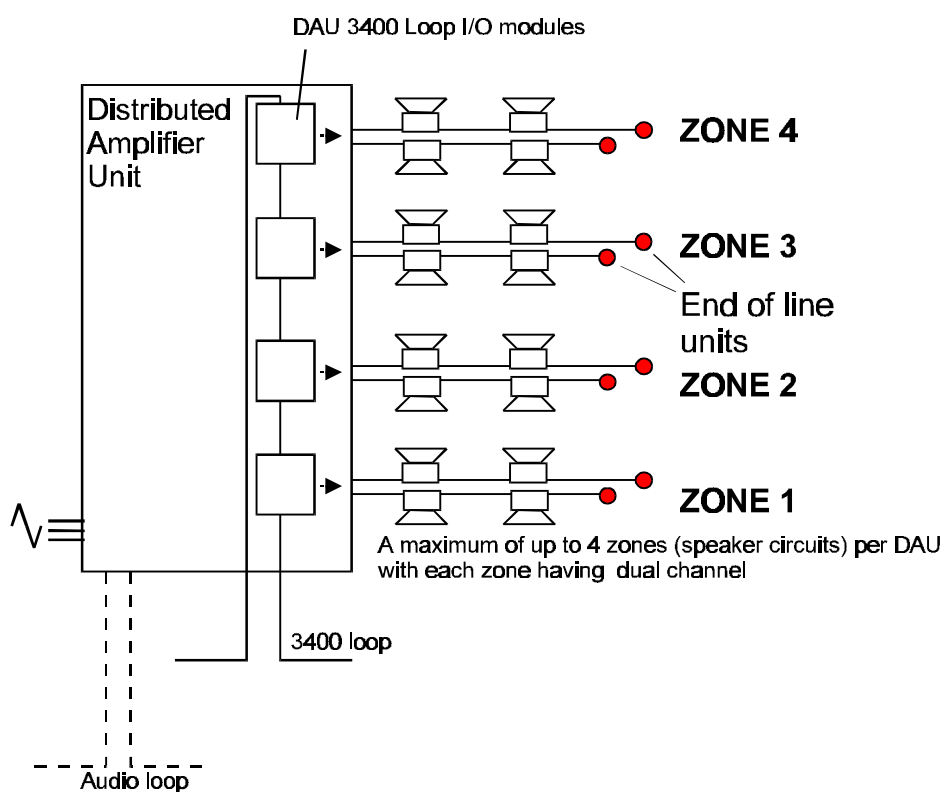


Figure 8-2 DAU zone circuits
cdm79

Loudspeaker zone	Each zone consists of dual 100 volt line outputs to the loudspeaker circuits. The accumulative power of loudspeakers on each circuit will help decide the power amplification requirement.
DAU 3400 Loop interface	Each zone of a DAU will require a <i>13426-02 DAU 3400 loop I/O module</i> to be installed on the chassis plate to allow automatic operation of emergency messages in a fire condition.
	A zone is automatically actioned by the 3404/8 control panel in the event of a fire to activate evacuate or alert message store.

How to calculate the loudspeaker circuit loading

Loudspeaker circuit loadings are limited by the amplifier power available and the length of cable required to cover an area.

loudspeaker power	When the loudspeaker layout design has been completed and the power settings calculated it will be possible to total-up the power required in each loudspeaker zone.
Dual loudspeaker circuit	Where the system is being installed to BS 7443 the load can be split equally between the two circuits. The amplifiers then chosen must have enough capacity to drive the loudspeaker load with a safety margin of about 25%.
Loading example	<p>Total loudspeaker zone load = 310Watts</p> <p>Each loudspeaker circuit load = $310/2 = 155\text{Watts}$</p> <p>Allowing for a 25% safety margin the amplifier power should be at least:- $155 \times 1.25 = 194\text{Watts}$</p> <p>Therefore an amplifiers of at least 200W would be chosen.</p>
Exceptions	In some standards e.g. BS 7827 for sports establishments, a headroom of +6dB is required. For example this implies that a 100watt installation would have to have the capability to drive upto 400Watts, ie a safety margin of 75%. Check system requirements before designing - amplifiers are expensive.

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Siting and setting loudspeakers

Where appropriate refer to designers notes, cable types and speakers.

How to determine ceiling loudspeaker placement

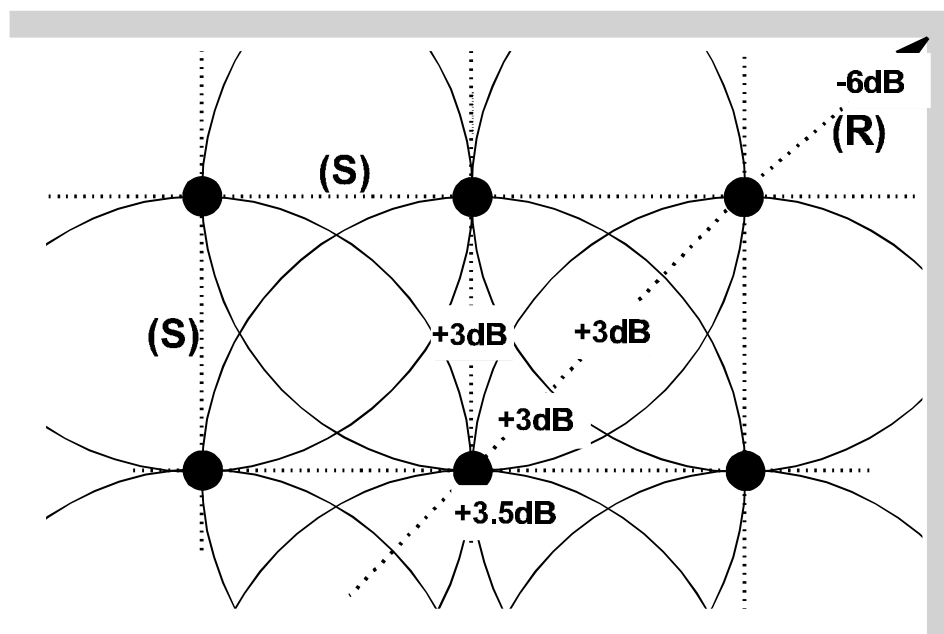
Where loudspeakers are to be mounted in the ceiling they should be fitted, as far as possible, on a square grid.

Table 9-1 Ceiling speaker height and spacing

Ceiling Height	Loudspeaker Horizontal Spacing (S)	Coverage	Distance(R)
Up to 2.5m	5m	25m ²	3.5m
2.5m - 4.5m	6m	36m ²	4.5m
4.5m - 7.5m	7m	49m ²	5m
7.5m - 10.5m	8m	64m ²	6m

NOTE: These numbers stated in the table are approximate and are for frequencies around 1KHz to 4KHz.

Figure 9-1 Ceiling height and linear spacing



cdm142

Estimation

For estimation purposes the floor area may be divided by the loudspeaker area coverage, to obtain the number of loudspeakers required, however room geometry will generally require a slightly higher number than given by this method.

Placement When placing loudspeakers it is useful to ensure that no point is horizontally more than a certain distance, see Table 9-1. This is not as critical as placing smoke detectors, because loudspeakers are trying to convey information to people and if an area cannot be accessed by anybody there is little point in trying to cover it.

When placed in a grid format at the spacing recommended in Table 9-1, the contributions from all the loudspeakers produce a level that is about **3dB** above the level that would be produced directly below a single unit mounted at the same height and set to a similar power tapping, see Figure. 9-1.

How to space out loudspeakers mounted to wall

Where loudspeakers are **cabinet types** to be wall mounted, they should be fitted at a height of **2.5m to 3m** and spaced **7.5m** apart along the wall. Power settings should be set to give **10dB** above the background at the furthest point from the loudspeaker.

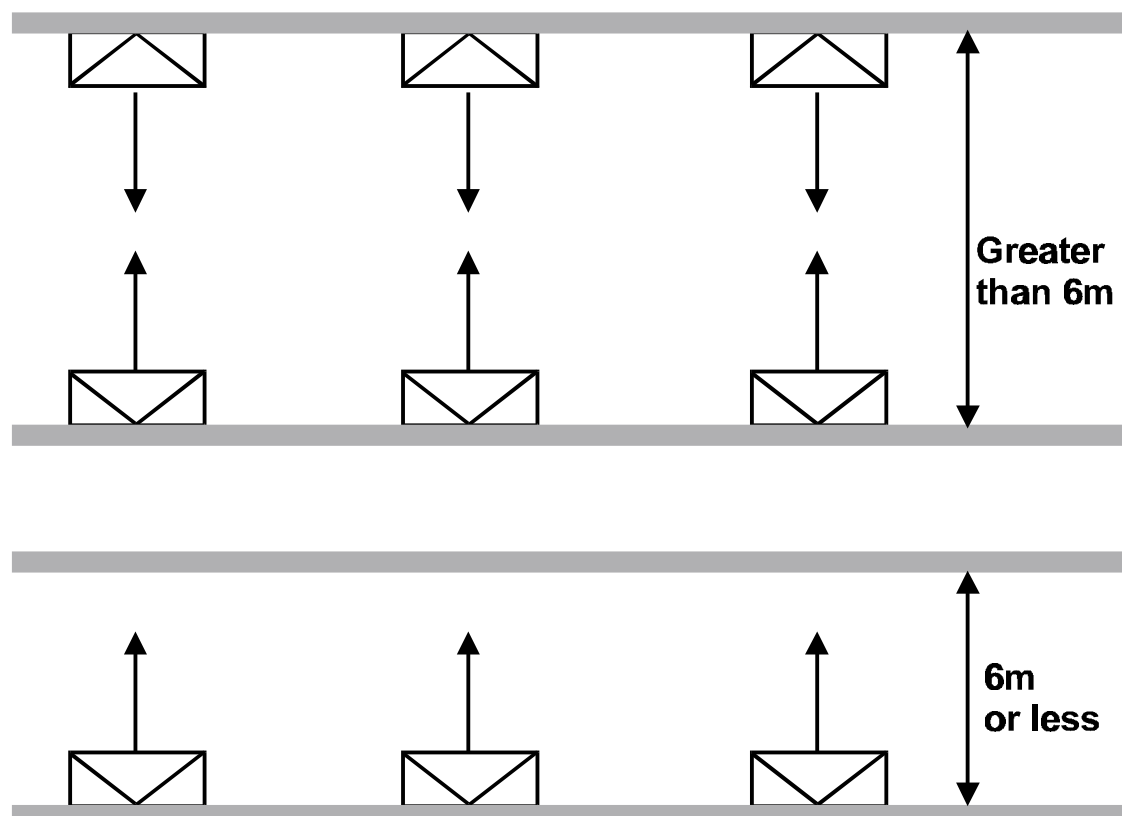


Figure 9-2 Cabinet speakers on walls
cdm143

As general guidance in rooms less than **6m** wide cabinets can be fitted along one wall only. Above **6m** the loudspeakers should be fitted to opposing walls.

Loudspeaker power tap

Once the number of loudspeakers has been estimated the power requirement can be determined, which is specific to the loudspeaker types.

It is recommended that for a ceiling is no more than **5m** in height, with a listening height of **1.2m** to **1.5m**.

Standard loudspeaker tappings	Ceiling	0.75w to 1.5w
	Cabinet	1.0w to 3.0w
	Bi-Directional	1.5w to 3.0w
	Horn (15w)	3.0w to 8.0w
	Horn (30w)	8.0w to 12.0w

Factory loudspeaker tap setting

Loudspeakers are normally supplied by the manufacturers set to their maximum power tapping and must be adjusted to an appropriate tapping during installation.

As fitted drawings

The *as fitted drawings* should state the required tapping, particularly if it is different from the factory supplied setting. The exactappings available will depend on the loudspeaker used. The contractor will therefore need information on loudspeaker tap settings before installation.

CAUTION: *If incorrect tap setting is selected then there is a risk of overloading the amplifiers.*

Factors affecting the tap selection

Background Noise

Background noise can be measured or it can be estimated from similar environments in the case of new buildings.

Unlike alarm sounders, which are normally set to give **5dB** above the background level, voice systems are set to give at least **10dB** above. In emergency situations there can be a rise in background levels due to the operation of escape route pressurisation fans and smoke curtains. This change in level can be significant and should be taken into account at the design stage.

Paging and background music

Where the system is also to be used for paging or background music purposes the paging should be set to give background level +10dB, (this background might be different to the background level in an emergency situation) and the music background + 3dB (This is audible without being intrusive).

Power tap

Power tap settings for ceiling mounted loudspeakers:

- ☐ 13426-12 6W flush ceiling loudspeaker
- ☐ 13426-21 6W cabinet loudspeaker (when surface fixed to a ceiling)

The following table is calculated on the basis of giving 10dB above the stated background levels.

Table 9-2 Power tapping for ceiling mounted speaker

CeilingHeight	Background Noise Level					
	65dB	70dB	75dB	80dB	85dB	90dB
2.5m	0.75	0.75	0.75	0.75	1.5	6.0
3.0m	0.75	0.75	0.75	1.5	3.0	-
3.5m	0.75	0.75	0.75	3.0	6.0	-
4.0m	0.75	0.75	1.5	6.0	-	-
4.5m	0.75	0.75	3.0	6.0	-	-
5.0m	0.75	0.75	3.0	-	-	-
5.5m	0.75	1.5	3.0	-	-	-

6W Cabinet loudspeaker power tap selection

Sound pressure level (dB) at varying distances and power input settings for:

- ☐ 13426-12 6W flush ceiling loudspeaker
- ☐ 13426-21 6W surface cabinet loudspeaker
- ☐ 13426-25 6W flush cabinet loudspeaker

The following table is calculated on the basis of giving **10dB** above the stated background levels.

	Distance from loudspeaker (m)									
Watts	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
0.75	96	91	87	85	83	81	80	79	78	77
1.5	99	94	90	88	86	84	83	82	81	80
3.0	102	97	93	91	89	87	86	85	84	83
6.0	105	100	96	94	92	90	89	88	87	86

Table 9-3 Sound level against distance for 6W speakers

	Distance from loudspeaker (m)									
Watts	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
0.75	76	75	75	74	74	73	72	72	71	71
1.5	79	78	78	77	77	76	75	75	74	74
3.0	82	81	81	80	80	79	78	78	77	77
6.0	85	84	84	83	83	82	81	81	80	80

	Distance from loudspeaker (m)									
Watts	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.5
0.75	70	70	70	69	69	69	68	68	68	67
1.5	73	73	73	72	72	72	71	71	71	70
3.0	76	76	76	75	75	75	74	74	74	73
6.0	79	79	79	78	78	78	77	77	77	76

NOTE: The shaded areas denote levels considered too low for good intelligibility ie less than 75dB

4W Cabinet loudspeaker power tap selection

Sound pressure level (dB) at varying distances and power input settings for:

- ☐ 13426-20 4W surface cabinet loudspeaker
- ☐ 13426-24 4W flush cabinet loudspeaker

NOTE: *These 4W cabinets are inefficient compared to the 6W counterparts and less easy to install due to their smaller physical size, it is recommended that their use is restricted to areas where space or aesthetics is important, e.g. toilets, small offices.*

	Distance from loudspeaker (m)									
Watts	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
0.75	89	84	80	78	76	74	73	72	71	70
1.5	92	87	83	81	79	77	76	75	74	73
3.0	95	90	86	84	82	80	79	78	77	76
6.0	98	93	89	87	85	83	82	81	80	79

Table 9-4 Sound level against distance for 4W speakers

	Distance from loudspeaker (m)									
Watts	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
0.75	69	68	68	67	67	66	64	65	64	64
1.5	72	71	71	70	70	69	68	68	67	67
3.0	75	74	74	73	73	72	71	71	70	70
6.0	78	77	77	76	76	75	74	74	71	71

NOTE: The shaded areas denote levels considered too low for good intelligibility ie less than 75dB

Loudspeaker cable losses

Where appropriate refer to designers notes, cable types, amplifier module.

Cable power loss

Having identified the **amplifier zonal** requirements the **cable power loss** must be considered. This is ensure that power can be distributed effectively along the cable length and an allowance is made any power loss.

Normally the length/cross sectional area of the loudspeaker circuit cable should be chosen so that power loss does not exceed 1dB, see Table 10-1.

Loudspeaker power vs cable length for a 1dB loss in power (Assumes worst case with load at one end of the cable. 1dB loss is approximately equal to a drop of 10V at the end of the line).

Loudsp'ker Load (100V line)	Loudsp'ker load imp (ohms)	Cable sizes					Cable loop imp (ohms)
		1.0mm ² (18.1R/Km)	1.5mm ² (12.1R/Km)	2.5mm ² (7.41R/Km)	4.0mm ² (4.61R/Km)	6.0mm ² (3.08R/Km)	
25watts	400	1230m	1840m	3000m	4820m	7215m	44
50watts	200	615m	920m	1500m	2410m	3610m	22
75watts	133	410m	610m	1000m	1605m	2405m	15
100watts	100	310m	460m	750m	1205m	1805m	11
150watts	67	205m	310m	500m	800m	1205m	7
200watts	50	155m	230m	375m	600m	900m	6
250watts	40	120m	185m	300m	480m	720m	4

Table 10-1 Loudspeaker power vs cable length

If the loudspeaker load is spread evenly along the cable the cable distances given can be extended by up to 40%. In practice **4mm²** and **6mm²** sizes are rarely used due to the practical difficulties of wiring the loudspeakers, but may be required to distribute power to clusters of very high power loudspeakers.

Cable capacitance

Although cable impedance is an important consideration, capacitance is also a limiting factor, particularly as voice alarm systems are frequently installed using MICC type cables. Capacitance has a particular affect on frequency response and on high frequency monitoring which operates in the range 20KHz to 25KHz.

Loudspeaker circuit length

In practice loudspeaker circuits should be limited to lengths of around 1000m

NOTE: There are some PA companies that allow for power losses of up to 3dB at the end-of-line. This effectively lets the drive voltage drop from 100V to 70V. This however is not good practice as only half of the amplifiers power can be used to drive the loudspeakers.

Providing larger amplifiers to resolve power loss is of no benefit, because to gain any benefit it is the line voltage that would need to be increased not amplifier power. The line voltage is fixed at 100V.

Table 10-2
Cable
losses at
1dB and
3dB

Loudsp'ker Load (100V line)	1dB output loss			3dB output loss		
	Watts in Loudsp'krs	Watts in cable	Total circuit Watts	Watts in Loudsp'krs	Watts in cable	Total circuit Watts
25watts	20	2	22	12	5	17
50watts	41	5	46	25	11	36
75watts	61	7	68	37	16	53
100watts	81	9	90	50	21	71
150watts	122	15	137	75	32	107
200watts	162	18	180	100	42	142
250watts	203	25	228	125	53	178

The effect of cable losses at both 1dB and 3dB is shown in Table 10-2. If the loss of output is corrected by retapping the loudspeakers to the next setting, e.g. increasing a 50W load to a 100W then with the 1dB-loss circuit the increase provides a 2.1dB increase, but the 3dB -loss circuit can only manage 0.7dB because of the series cable resistance. Not only is the power lost in the cable, but the maximum power cannot be developed in the circuit.

Amplifier module selection

Range of amplifier modules

Orator amplifiers are 100 V line types and are available in the following sizes:

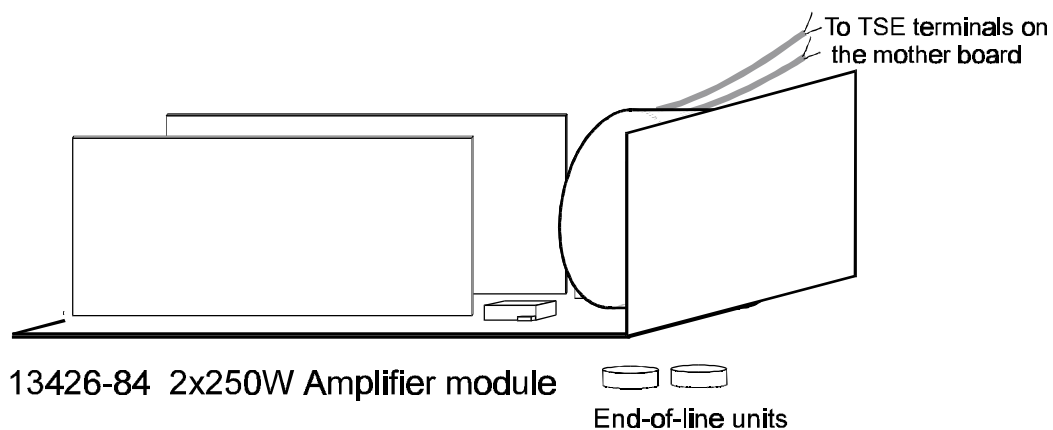
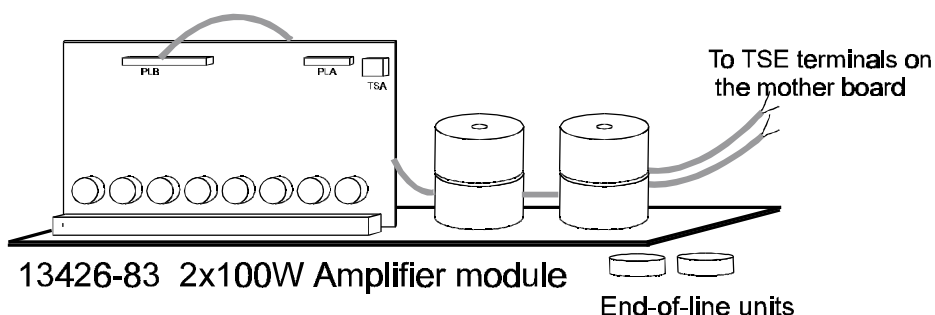
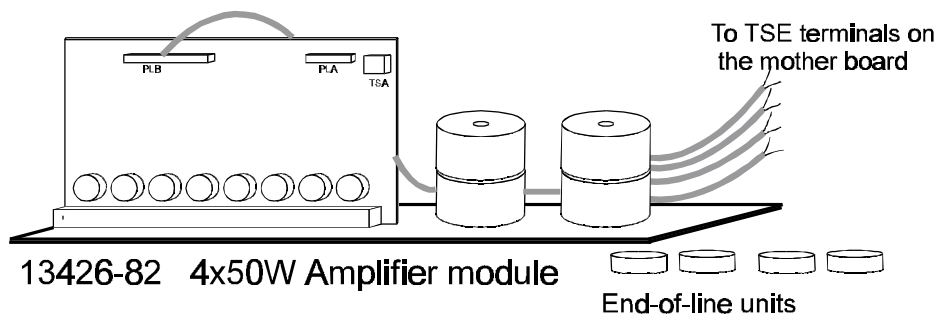
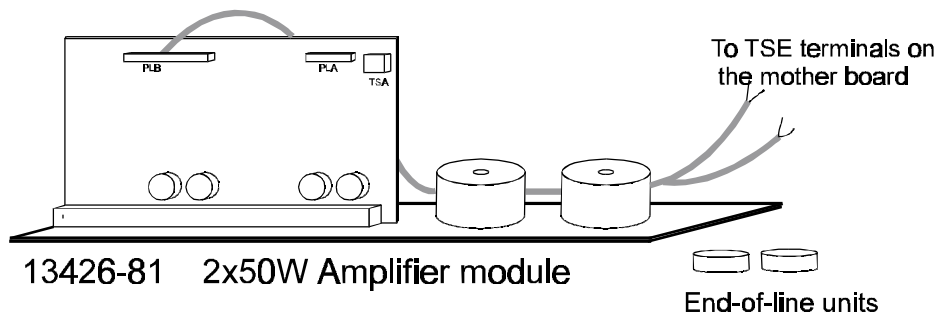


Figure 11-1 Amplifier modules
cdm57

How to calculate the power requirement

Calculation The amplifier requirement is:

$$= \frac{\text{Power required by zone}}{\text{number of amplifiers}} \times \text{safety factor}$$

Power required by zone The power required by the zone will be the sum of the power required by all of the loudspeakers in the zone. The individual power is calculated from the required sound level and sensitivity of each loudspeaker.

Safety factor The safety factor allows for the amplifiers to be rated above their expected operating level. The minimum safety factor is 1.25. The following levels are specified by standards:

- BS7443 1.25 (20% safety margin)
- BS7827 4.0 (quoted as +6 dB, 75% safety margin)

The potential cost of providing large safety factors is high. Check the precise customer requirements to identify what the safety factor is and to precisely which system components (amplifiers, cables, loudspeakers) it applies.

How to select the amplifier modules

The four amplifier modules can be used in up to eight standard configuration

The choice of option is usually made during voice alarm system design. The project specification should state the selected amplifier module(s), which is dependant on:

- ☐ the loudspeaker circuit power requirement
- ☐ and number of loudspeaker circuits (zone circuits)

NOTE: Each zone makes use of two amplifier channels to supply two loudspeaker circuits.

Options 1 to 8

Options	Amplifier Modules	Module fixing Position	Zone 1	Zone 2	Zone 3	Zone 4
1	13426-81 2x50W -	1 -	50Wx50W	unused	unused	unused
2	13426-81 2x50W 13426-81 2x50W	1 2	50Wx50W	50Wx50W	unused	unused
3	13426-82 4x50W 13426-81 2x50W	1 2	50Wx50W	50Wx50W	50Wx50W	unused
4	13426-82 4x50W 13426-82 4x50W	1 2	50Wx50W	50Wx50W	50Wx50W	50Wx50W
5	13426-82 4x50W 13426-83 2x100W	1 -	50Wx50W	50Wx50W	100Wx100W	-
6	13426-83 2x100W -	1 -	100Wx100W	-	-	-
7	13426-83 2x100W 13426-83 2x100W	1 2	100Wx100W	100Wx100W	-	-
8	13426-84 2x250W	1 & 2	250Wx250W	-	-	-

Table 11-1 Amplifier standard options

Standard Options and loudspeaker zones

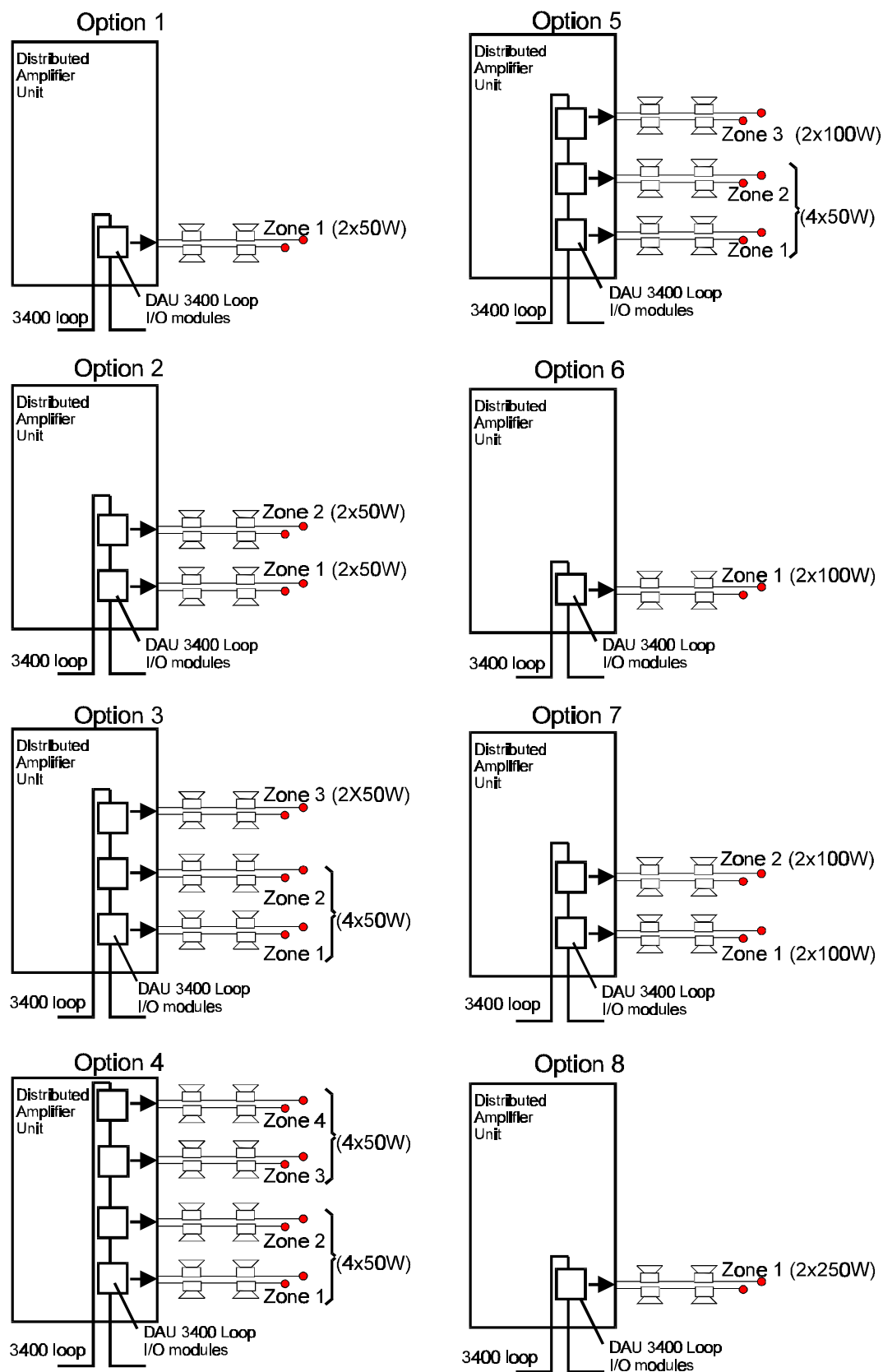


Figure 11-2 Speaker zone options and power rating
cdm144

Where to install the amplifier module(s)

The amplifier modules are installed in the distributed amplifier unit (DAU). There are two fixing positions on the chassis plate and the installation of the modules is dependant on the choice of Option.

Amplifier Modules

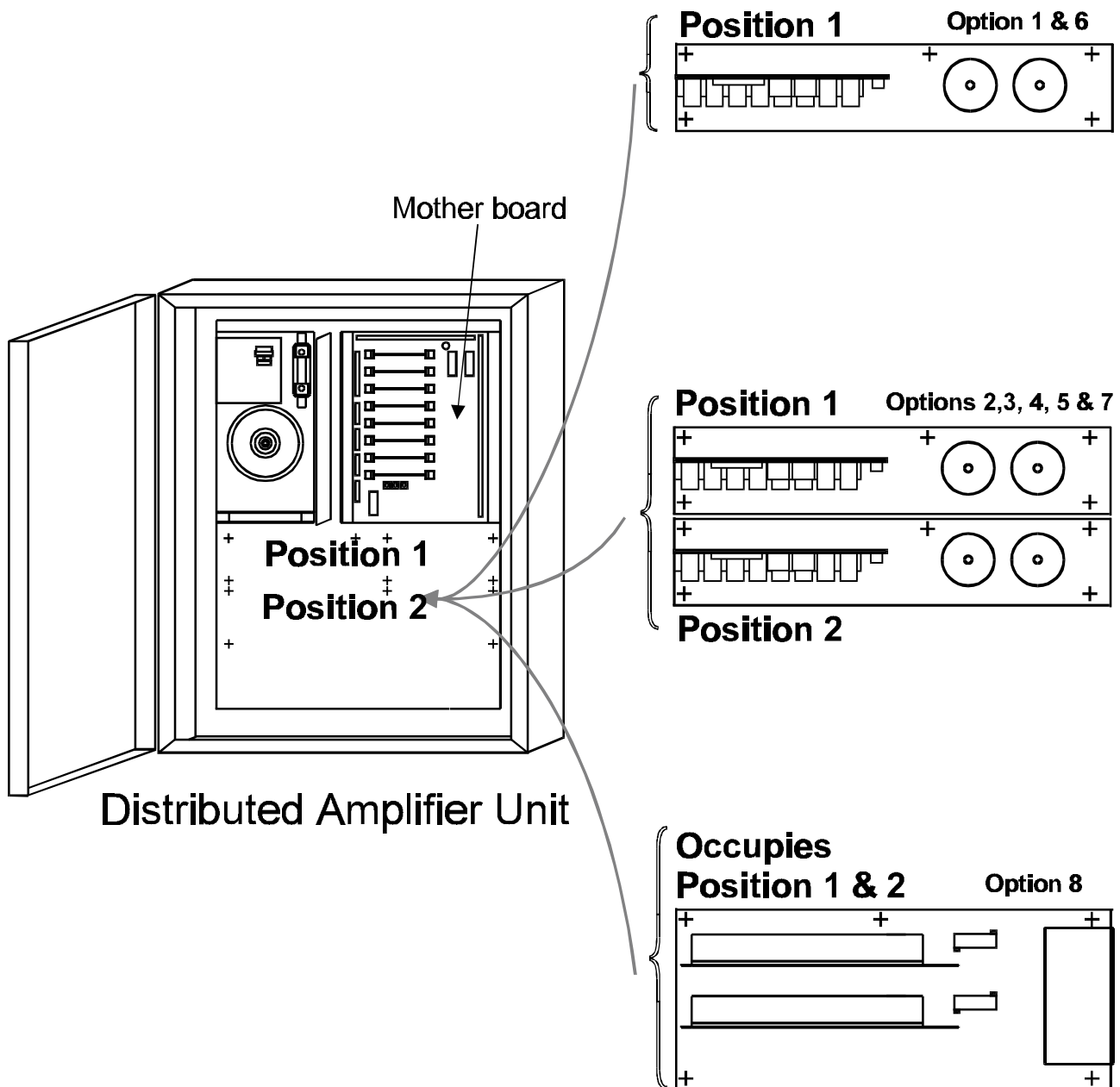


Figure 11-3 Fitting the amplifier module
cdm56

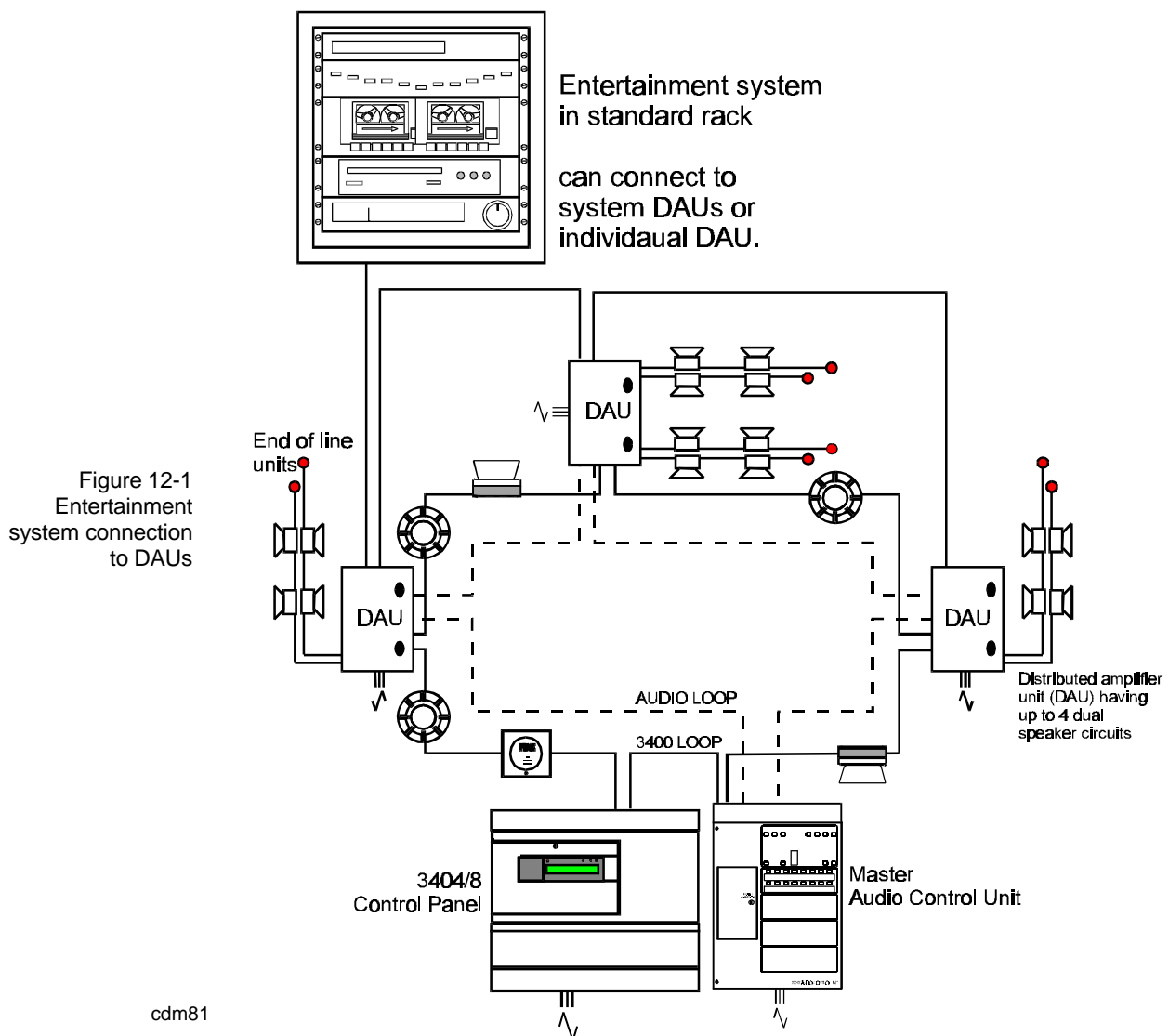
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Entertainment system

The Orator system can accept input from an entertainment system to allow broadcast of music to all connected distributed amplifier zones.

- Options**
- ☐ 6 Input mixer preamplifier (2U)
 - ☐ Graphic equaliser (2U)
 - ☐ AM / FM Tuner (1U)
 - ☐ CD Player - 10disc capacity (3U)
 - ☐ Cassette player - twin desk auto reverse (3U)
 - ☐ Monitor panel to facilitate source set up (2U)

- Racks**
- ☐ Various racks in 12U, 16U, 20U, 34U and 43U size are available to accept the Public Address (PA) equipment, pre-wired



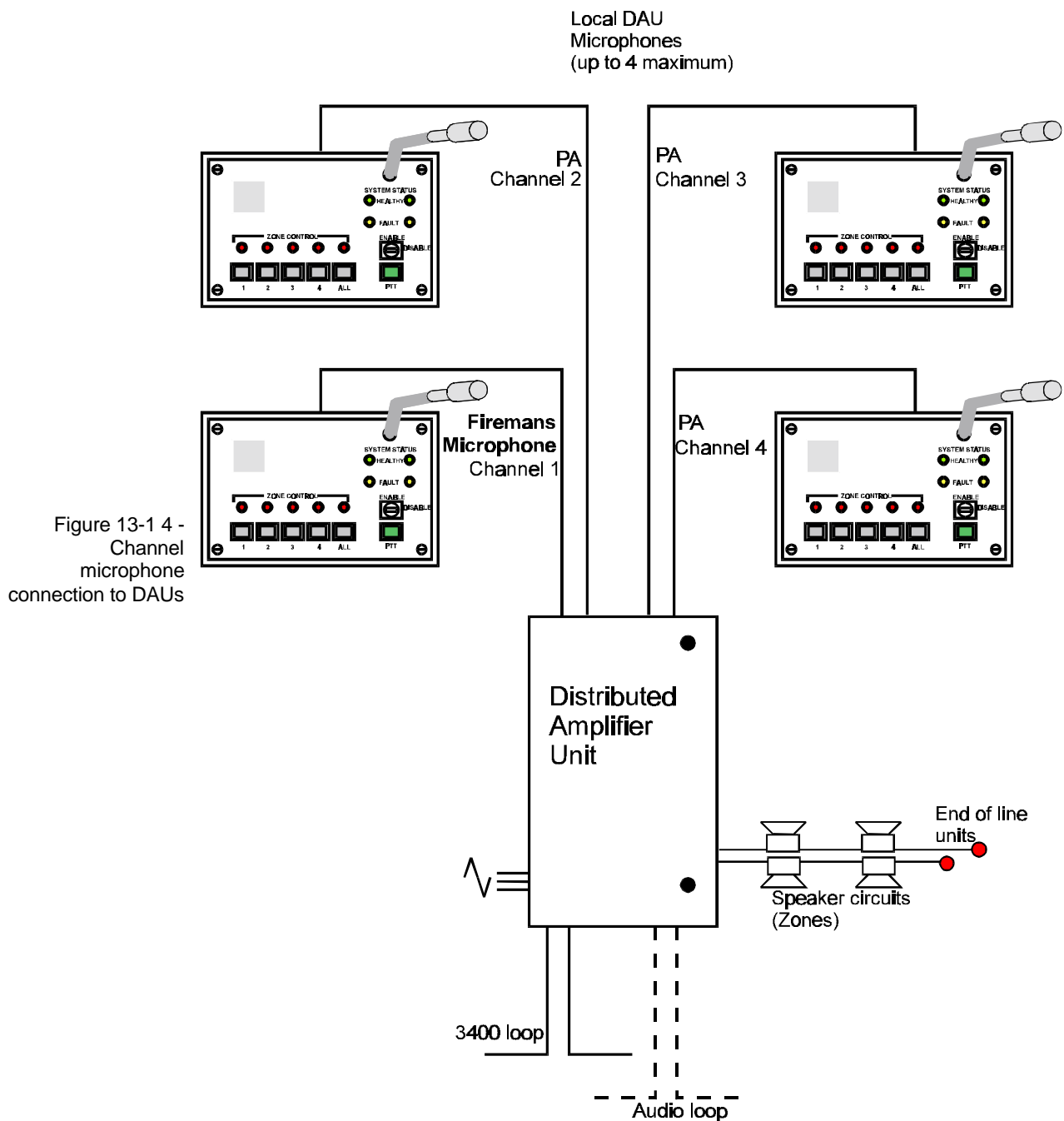
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4 - Zone microphone

A standard 4 - zone microphone unit can be connected to a distributed amplifier unit to allow public address and fire announcement to the amplifier zones. Up to four microphone units can be connected to a DAU.

- ☐ The **channels 2, 3 and 4** are used for *low priority PA* announcement
- ☐ while **channel 1** is reserved for *high priority fire* announcements.



cdm80

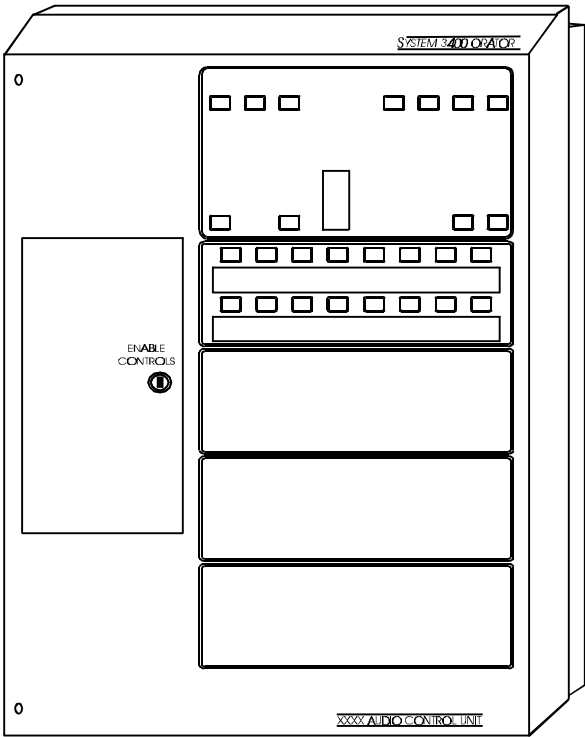
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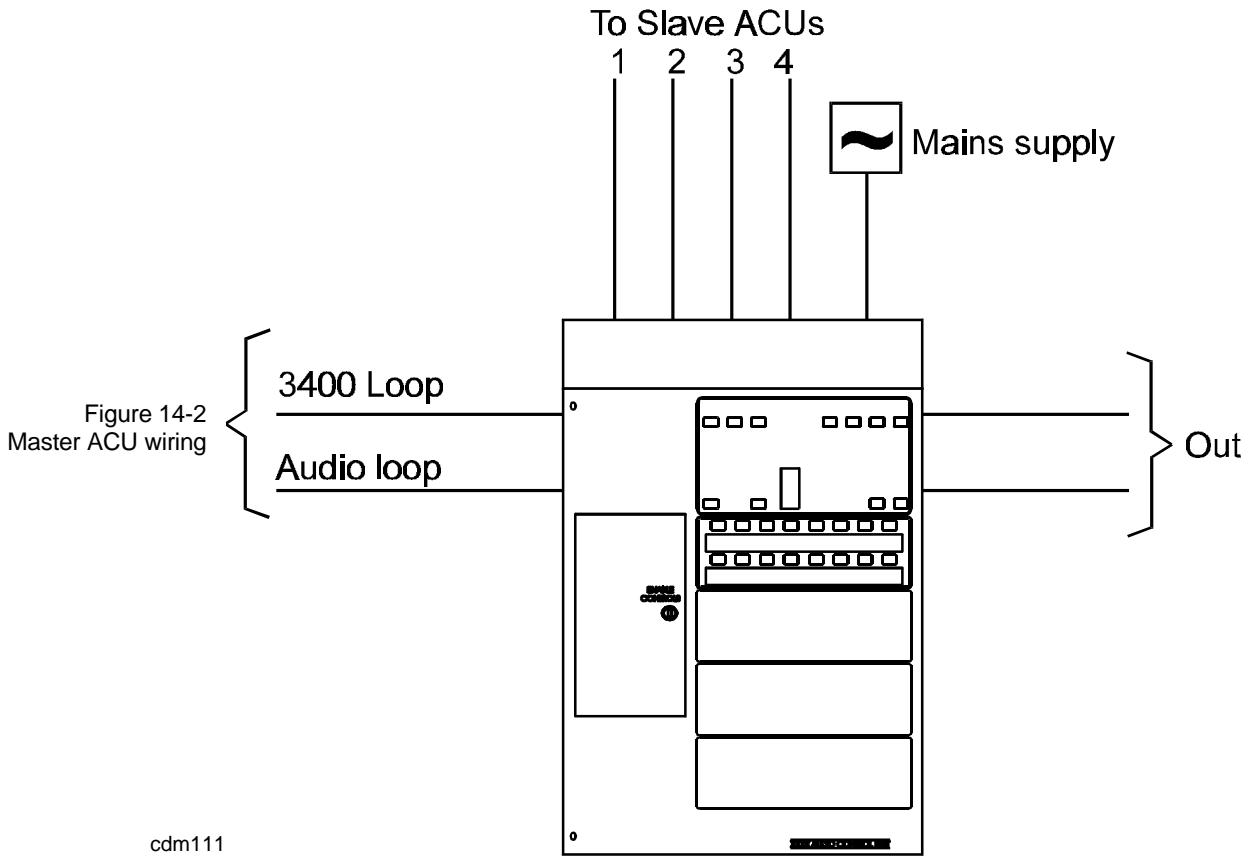
13425-01 MASTER Audio Control Unit

Figure 14-1
MASTER Audio
Control Unit

cds19



The MASTER Audio Control Unit (ACU) is a mains powered and battery backed unit that is normally installed next to a 3400 control panel. It connects to the 3400 fire system loop and the voice system audio loop.



The unit initiates broadcast of live speech and pre-recorded messages throughout a protected site or to its selected areas (zones), using manual controls. Its use is primarily for broadcast of fire messages and other optional auxiliary messages which are site and application specific.

The voice output to all areas (zones) is via Distributed Amplifier Units (DAUs) having up to four zones of loudspeaker circuits.

Options

There are two types of ACUs

- ☐ Master Audio Control Unit (*code 13425-01*)
- ☐ Slave Audio Control Unit (*Code 13425-02*), see separate data sheet

In its basic form the master ACU is supplied as a 16 zone unit with options and expansion facility to include:

- ACU 16 zone extender kit (*Code 13425-02*)
up to 3 extender kits maximum per ACU
- ACU Slave interface (*Code 13425-25*)
- ACU Auxiliary message store (*Code 13425-30*)
- ACU 3400 loop I/O module (*Code 13425-31*)
- ACU I/O buffer board (*Code 13425-32*)
- Not available at the time of this manual was issue
Auxiliary Custom Message store (*Code 13426-50*)
up to 4 custom message stores maximum per ACU
- Message EPROM custom (*Code 13426-50*)

Specification

Standard:	Designed for use in	BSBS5839:Part 1 BS7443
Quantity per system	1 Master ACU per 3400-Orator II system	
Colour	Grey/Brown (cover) - Black (backbox)	
Unit dimensions	Width 442mm height 555mm depth 123mm	
Cable entries	20 Top-side entry points 10 Top-back entry points	
Full Assembly weight	?Kg + ?kg x 2 (batteries)	
Storage temperature	-30 to 70°C	
Operating temperature	0 to 40°C	
Relative Humidity (Non condensing) Temperature 5 - 40°C	up to 90%	
Mains Operating voltage	230V 50Hz +10% -6%	
Batteries	12V 12Ah sealed acid (2-off connected in parallel)	

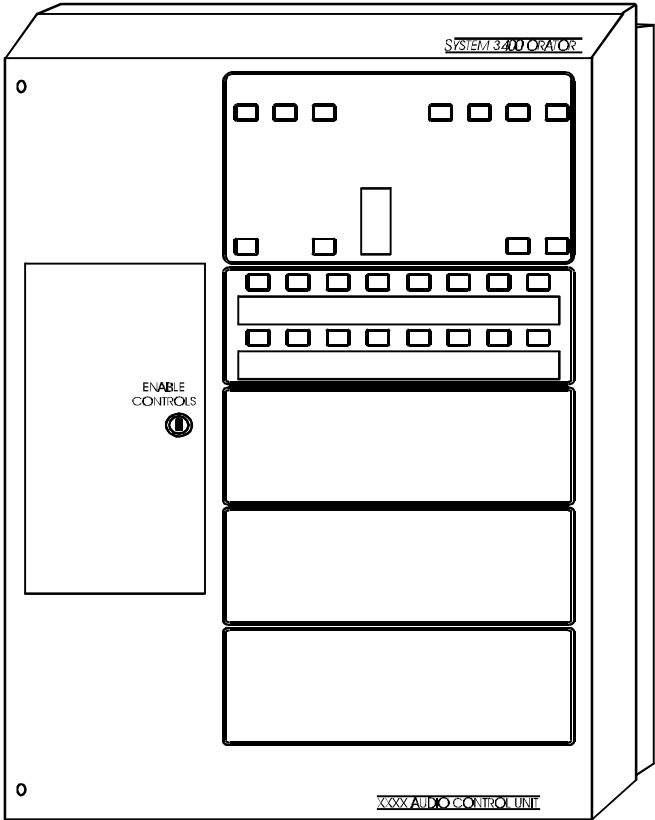
Standby supply capability	The integral battery-backed power supply will provide power for 24 hours in standby and a further 30 minutes in alarm.
3400 Address	1 address is taken by the ACU
Zones	A standard ACU is supplied as a 16 zone unit with expansion slots to allow upgrade of up to 64 zones, in 16 zone increment.
Indicators Light	AUDIO LOOP, POWER, MIC (Green) SLAVE ACU 1 to SLAVE ACU 4 IN USE and FAULT (Amber)
Active button light	MIC (Green) EVAC, ALERT, ALL ZONES and CANCEL ZONES - (Red) CANCEL FAULT BUZZER & LAMP TEST - (Amber) MSG 1 to MSG 4 - (Amber)
Audible indication	Given by an integral buzzer to announce a local ACU fault
Key enabled controls	The user controls on the unit are keyswitch enabled to allow authorised use of system controls.
Button controls (access to controls is possible by opening the microphone compartment door using a key)	ALL ZONES (Manually select all zones) CANCEL ZONES (Cancel all selected zones) MIC (Global Microphone) EVAC (Global Evacuate) ALERT (Global Alert) MSG 1 to MSG 4 (Message 1 to Message 4) CANCEL FAULT BUZZER LAMP TEST (Switches on all indicators) ZONE 1 to Zone 64 (zone select deselect buttons for use with global controls)
Common fault output (local faults only)	Common (C), Normally closed (NC) and normally open (NO) Voltage free contacts rated 1A @ 24Vdc resistive load,
Audio Loop	Connects the master ACU to all the DAUs in the 3400 Orator II system. The audio loop carries both messages and data from the master ACU to the distributed amplifier units in the system. The messages it carries may be from the fireman's microphone(s) or from the auxiliary message stores
Connection of Slave ACUs	Up to 4 per Slave ACUs can be connected to the master ACU One Slave card is required per connected Slave ACU The cards are installed sockets SK1 (slave 1) to SK4 (slave 4) of the mother board.
Fireman's Microphone (Messages are sent to the system via audio loop)	The <i>integral fireman's microphone</i> with Press to Talk button is located behind the enable controls door Up to 10 <i>external All Call Microphones</i> can be loop connected to the master ACU, fire announcements.
Evacuate message To selective zones under the control of ACU	Evacuate Fire messages broadcast to the Orator II system 3400 Evacuate tone 4-8s, Silence 1-2s, Voice "ATTENTION PLEASE, ATTENTION PLEASE. FIRE HAS BEEN REPORTED IN THE BUILDING. PLEASE LEAVE THE BUILDING IMMEDIATELY BY THE NEAREST EXIT." - silence 2-5s and sequence repeats
Alert message To selective zones under the control of ACU	Alert Fire message broadcast to the Orator II system 3400 Alert tone 4-8s, silence 1-2s, Voice "MAY I HAVE YOUR ATTENTION PLEASE. MAY I HAVE YOUR ATTENTION PLEASE. FIRE HAS BEEN REPORTED IN THE BUILDING. WHILE THE REPORT IS BEING INVESTIGATED PLEASE REMAIN AT YOUR WORK PLACE." - Silence 2-5s and sequence repeats

Global Auxiliary Messages (Messages are sent to the system via Audio Loop)	There can be up to 4 auxiliary messages initiated at the ACU for broadcast to Orator II System, each message can be up to 45 second duration used for applications like: Bomb alert Day to day timed routine announcements To call all faithful to prayer Class change announcement (use in schools and colleges) Requires an Auxiliary Message card in J3 of ACU-Sub-board. A custom chip is required in ICtba on the card for custom auxiliary message 1 and in IC13, IC14 and IC18 of Mother board for custom auxiliary messages 2,3 and 4.
Emission	BS EN50081-1:1992 Part 1 Residential, Commercial & Light Industry Class B limits
Electrostatic discharge immunity	IEC 801-2 Level ± 8KV - air discharge ± 6KV - contact discharge
Radio Frequency Interference (assuming EMC complaint cable used)	
Radiated immunity	80MHz - 1GHz (DD ENV50140:1994) 10V/m
Conductive immunity	150KHz to 100MHz (DD ENV50141:1994) 140dBuV
Transients immunity	IEC 801-4 Level ± 2KV
Surge immunity	Common Mode Surge immunity - 1KV input output lines Differential Mode and Common Mode surge immunity - 2KV mains line
Ingress Protection	IP40 estimated
Vibration	5 to 60Hz

13425-02 SLAVE Audio Control Unit

Figure 15-1 SLAVE Audio Control Unit

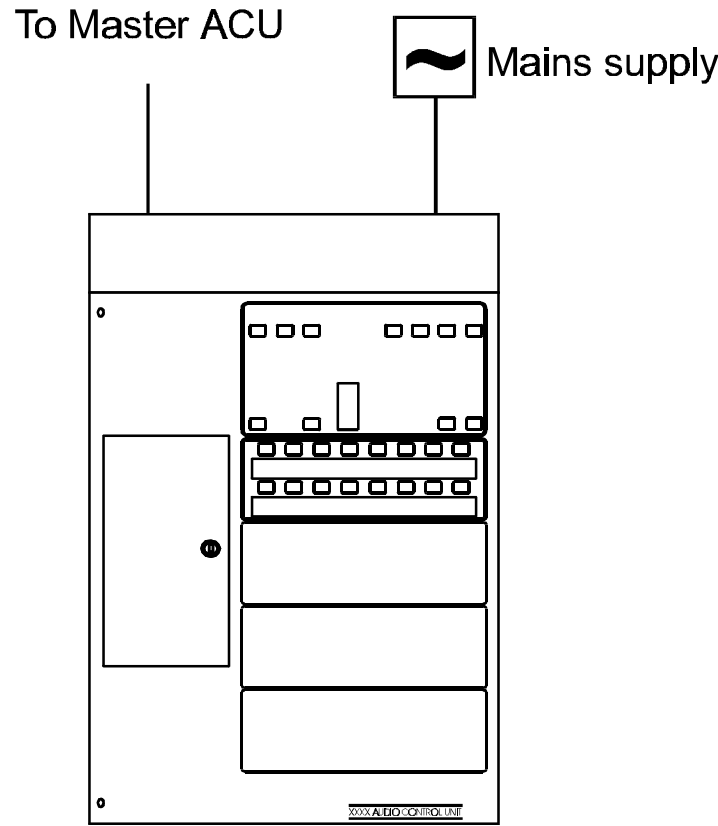
cds19



The SLAVE Audio Control Unit (ACU) is a mains powered and battery backed unit that is normally installed next to a 3400 repeat panel and connects to the MASTER ACU.

Figure 15-2 Slave ACU wiring

cdm112



The unit initiates broadcast of live speech and pre-recorded messages throughout a protected site or to its selected areas (zones), using manual controls. Its use is primarily for broadcast of fire messages and other optional auxiliary messages which are site and application specific.

The voice output to all areas (zones) is via Distributed Amplifier Units (DAUs) having up to four zones of loudspeaker circuits.

Options

There are two types of ACUs

- ☐ Slave Audio Control Unit (*Code 13425-02*)
- ☐ Master Audio Control Unit (*code 13425-01*), see separate data sheet

In its basic form the slave ACU is supplied as a 16 zone unit with options and expansion facility to include:

- ACU 16 zone extender kit (*Code 13425-02*)
up to 3 extender kits maximum per ACU
- ACU Slave interface (*Code 13425-25*)

Specification

Standard:	Designed for use in	BSBS5839:Part 1 BS7443
Quantity per system	Up to 4 Slave ACUs can be connected to a Master ACU per 3400-Orator II system	
Colour	Grey/Brown (cover) - Black (backbox)	
Unit dimensions	Width 442mm height 555mm depth 123mm	
Cable entries	20 Top-side entry points 10 Top-back entry points	
Full Assembly weight	?Kg + ?kg x 2 (batteries)	
Storage temperature	-30 to 70°C	
Operating temperature	0 to 40°C	
Relative Humidity (Non condensing) Temperature 5 - 40°C	up to 90%	
Mains Operating voltage	230V 50Hz +10% -6%	
Batteries	12V 12Ah sealed acid (2-off connected in parallel)	
Standby supply capability	The integral battery-backed power supply will provide power for 24 hours in standby and a further 30 minutes in alarm.	
3400 Address	1 address is taken by the ACU	
Zones	A standard ACU is supplied as a 16 zone unit with expansion slots to allow upgrade of up to 64 zones, in 16 zone increment.	

Indicators	Light	AUDIO LOOP, POWER, MIC (Green) SLAVE ACU 1 to SLAVE ACU 4 IN USE and FAULT (Amber)
	Active button light	MIC - (Green) EVAC, ALERT, ALL ZONES and CANCEL ZONES - (Red) CANCEL FAULT BUZZER & LAMP TEST - (Amber) MSG 1 to MSG 4 - (Amber)
Audible indication		Given by an integral buzzer to announce a local ACU fault
Key enabled controls		The user controls on the unit are keyswitch enabled to allow authorised use of system controls.
Button controls (access to controls is possible by opening the microphone compartment door using a key)		ALL ZONES (Manually select all zones) CANCEL ZONES (Cancel all selected zones) MIC (Global Microphone) EVAC (Global Evacuate) ALERT (Global Alert) MSG 1 to MSG 4 (Message 1 to Message 4) CANCEL FAULT BUZZER LAMP TEST (Switches on all indicators) ZONE 1 to Zone 64 (zone select deselect buttons for use with global controls)
Common fault output (local faults only)		Common (C), Normally closed (NC) and normally open (NO) Voltage free contacts rated 1A @ 24Vdc resistive load,
Connection of Slave ACUs		Up to 4 per Slave ACUs can be connected to the master ACU One Slave card is required per connected Slave ACU The cards are installed sockets SK1 (slave 1) to SK4 (slave 4) of the mother board.
Fireman's Microphone (Messages are sent to the system via audio loop)		The <i>integral fireman's microphone</i> with Press to Talk button is located behind the enable controls door
Evacuate message To selective zones under the control of ACU		Evacuate Fire messages broadcast to the Orator II system 3400 Evacuate tone 4-8s, Silence 1-2s, Voice "ATTENTION PLEASE, ATTENTION PLEASE. FIRE HAS BEEN REPORTED IN THE BUILDING. PLEASE LEAVE THE BUILDING IMMEDIATELY BY THE NEAREST EXIT." - silence 2-5s and sequence repeats
Alert message To selective zones under the control of ACU		Alert Fire message broadcast to the Orator II system 3400 Alert tone 4-8s, silence 1-2s, Voice "MAY I HAVE YOUR ATTENTION PLEASE. MAY I HAVE YOUR ATTENTION PLEASE. FIRE HAS BEEN REPORTED IN THE BUILDING. WHILE THE REPORT IS BEING INVESTIGATED PLEASE REMAIN AT YOUR WORK PLACE." - Silence 2-5s and sequence repeats
Emission		BS EN50081-1:1992 Part 1 Residential, Commercial & Light Industry Class B limits
Electrostatic discharge immunity		IEC 801-2 Level ± 8KV - air discharge ± 6KV - contact discharge

Radio Frequency Interference (assuming EMC complaint cable used)	
Radiated immunity	80MHz - 1GHz (DD ENV50140:1994) 10V/m
Conductive immunity	150KHz to 100MHz (DD ENV50141:1994) 140dBuV
Transients immunity	IEC 801-4 Level ± 2KV
Surge immunity	Common Mode Surge immunity - 1KV input output lines Differential Mode and Common Mode surge immunity - 2KV mains line
Ingress Protection	IP40 estimated
Vibration	5 to 60Hz

13425-30 ACU Auxiliary message store

To be advised.

13425-25 ACU Slave interface

To be advised.

13425-20 ACU 16 zone extender kit

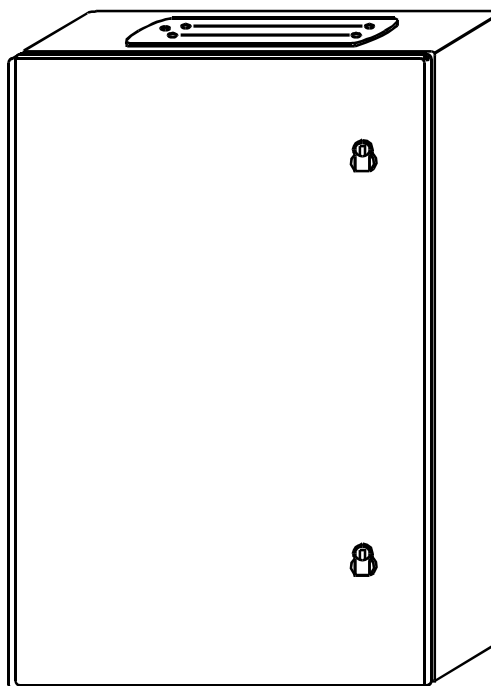
To be advised.

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13426-01 Distributed Amplifier Unit

Figure 17-1 Distributed Amplifier Unit

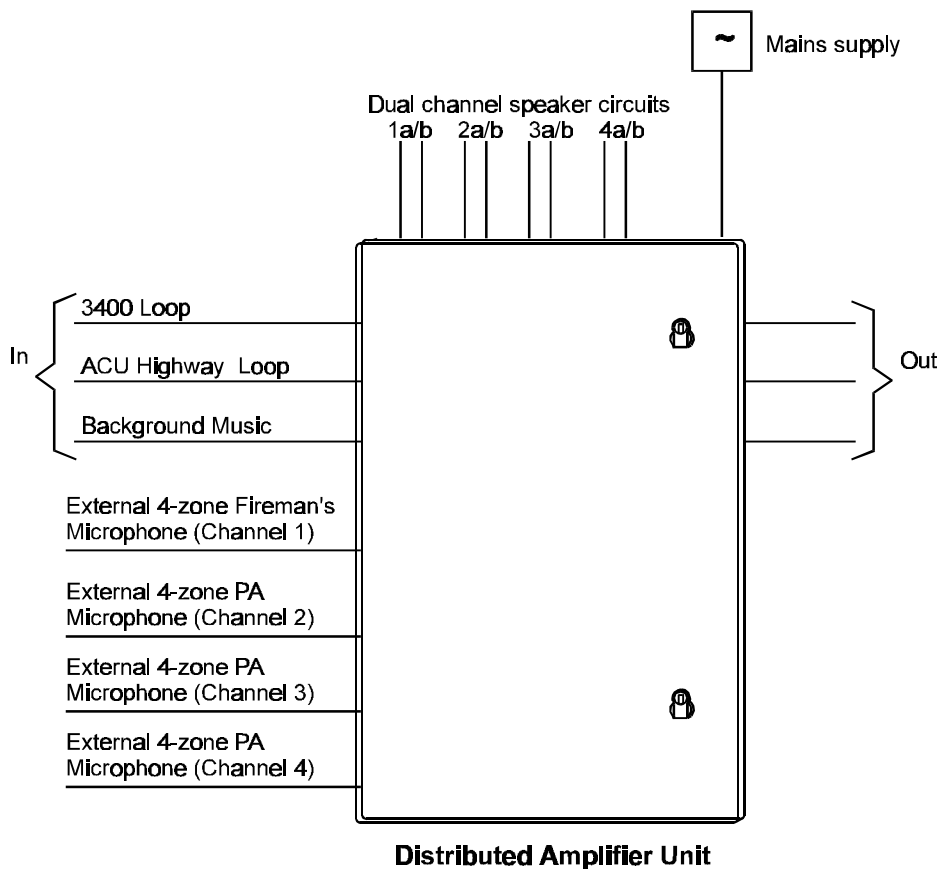
cds1



The Distributed Amplifier Unit (DAU) is a mains powered and battery backed unit that is normally installed near its loudspeaker circuit area. It amplifies audio for broadcast to its four zones of loudspeakers.

The audio signal is either live or pre-recorded messages. The live speech is from microphones in the system and pre-recorded messages are from digital stores, which are local at the Distributed Amplifier Unit.

Figure 17-2 DAU wiring



cdm113

Each DAU zone consists of dual channel loudspeaker circuits, with each channel powered from a separate amplifier module, to secure the broadcast of messages.

The amplification of audio is by means of amplifier modules installed in the DAU. There are a number of modules available with various power rating to meet the loudspeaker requirements.

Options

In its basic form a DAU Base Unit (*code 13426-01*) is supplied with assembled mother and power supply boards, with separate battery pack. The following options are available to allow a DAU to be customised for site specific application.

- ☐ DAU Message store Evacuate/Commissioning (*Code 13426-10*)
- ☐ DAU Message store Alert/Commissioning (*Code 13426-11*)
- ☐ Message EPROM Evacuate/Commissioning (*Code 13426-30*)
- ☐ Message EPROM Alert/Commissioning (*Code 13426-31*)
- ☐ DAU Audio loop module (*Code 13426-03*)
- ☐ DAU Message store with no message (*Code 13426-04*)
- ☐ Message EPROM Custom (*Code 13426-50*)
- ☐ DAU Local microphone access module (*Code 13426-05*)
- ☐ DAU Background music module (*Code 13426-06*)
- ☐ Amplifier module 2 x 50W & End-of-line units (*Code 13426-81*)
- ☐ Amplifier module 4 x 50W & End-of-line units (*Code 13426-82*)
- ☐ Amplifier module 2 x 100W & End-of-line units (*Code 13426-83*)
- ☐ Amplifier module 2 x 250W & End-of-line units (*Code 13426-84*)
- ☐ Orator End-of-line unit (*Code 13427-01*)

Specification

Standard: Designed to	BS5839 : Part 4
For use in	BSBS5839:Part 1 and BS7443
Colour	RAL 7032
Unit dimensions	Width 600mm height 800mm depth 250mm
Full Assembly weight	63.5Kg (Basic unpopulated DAU) + 10.0Kg (max) (Weight of amplifier chassis variant) + 28.0Kg (Batteries)
Storage temperature	-30 to 70°C
Operating temperature	0 to 40°C
Relative Humidity (Non condensing) Temperature 5 - 40°C	up to 90%
Mains Operating voltage	230V 50Hz +10% -6%
Batteries	12V 38Ah sealed acid (two connected in series)
Standby supply capability	The integral battery-backed power supply will provide power for 24 hours in standby load and a further 30 minutes in alarm load.
3400 Label	Each DAU can be given a label at the 3400 Control panel to identify its location in the system. The label is automatically displayed along with DAU events.
3400 Addresses taken up by a DAU	There can be a maximum of up to 32 3400 Orator-3400 Loop IO modules/Alarm Sounders per loop circuit. Each DAU can take up a maximum of up to five 3400 loop addresses: Up to four addresses can be taken up by Orator-3400 loop I/O modules to control the four DAU zones The fifth address is taken up by a single channel interface unit used to allow the DAU to be reset from the 3400 control panel
DAU voice alarm system address	There can be up to 16 DAU addresses per 3400-Orator II system. A DAU address is set by a switch on the mother board.
Zones	Each DAU can accommodate up to four zones of loudspeakers. Each zone consists of 100V dual channel loudspeaker circuits
Indicators on the mother board	DAU healthy status Dual channel zone circuit status (up to 4 zones per DAU) one indicator for each channel Sense test 20Khz Plug in card status Message cards (Alert and evacuate) Highway interface Microphone card Power supply board status Charger circuit status Supply On status Amplifier 1 & 2 (Battery & AC) Battery status ACU communications Minor fault (are associated with loudspeaker circuits) Major fault (are associated with other faults) PA in use
Indicators on the Power supply board	Battery sense DC healthy

Controls on the mother board	Reset button Clear fault button Power amplifiers button - for background music DAU address switch
Amplifier module configuration options for a DAU	There are eight amplifier module configuration options possible to cater for loudspeaker circuit power requirements Option 1 - 1 zone - using 1-off 2x50W Option 2 - 2 zones - using 2-off 2x50W Option 3 - 2 zones - using 1-off 4x50W Option 4 - 4 zones - using 2-off 4x50W Option 5 - 2 zones - using 1-off 2x50W + 1-off 2x100W Option 6 - 1 zone - using 1-off 2x100W Option 7 - 2 zones - using 2-off 2x100W Option 8 - 1 zone - using 1-off 2x250W
Optional cards and location of installation in the DAU mother board	Evacuate message card CARD100 (M0008) Alert message card CARD104 (M0004) Highway card CARD105 (M0003) Background music card CARD106 (M0002) 4-channel Microphone card CARD107 (M0001)
Global Live speech	Live speech is broadcast from ACU microphones via Audio loop to all DAU and its loudspeaker circuits in the 3400 Orator II system
Optional local live speech using 4-Zone Microphone Unit	Up to four - 4 zone microphone units can be connected to the four microphone channels in the DAU. When connected to terminals labelled: Channel 1 its use is for LOCAL Fire announcements only Channels 2, 3 and 4 its use is for LOCAL PA announcements. LOCAL meaning associated with DAU zones
Evacuate message (The message is initiated from <i>digital message store</i> in the local DAU or system ACU via Evacuate loop).	3400 Evacuate tone 4-8s, Silence 1-2s, Voice "ATTENTION PLEASE, ATTENTION PLEASE. FIRE HAS BEEN REPORTED IN THE BUILDING. PLEASE LEAVE THE BUILDING IMMEDIATELY BY THE NEAREST EXIT." - silence 2-5s and sequence repeats Requires an Evacuate Message card in slot CARD 100 (M0008) of DAU mother board
Alert message (The message is initiated from <i>digital message store</i> in the local DAU or system ACU via Alert loop).	3400 Alert tone 4-8s, silence 1-2s, Voice "MAY I HAVE YOUR ATTENTION PLEASE. MAY I HAVE YOUR ATTENTION PLEASE. FIRE HAS BEEN REPORTED IN THE BUILDING. WHILE THE REPORT IS BEING INVESTIGATED PLEASE REMAIN AT YOUR WORK PLACE." - Silence 2-5s and sequence repeats Requires an Alert Message card in slot CARD 104 (M0004) of DAU mother board
Global Auxiliary Messages (Messages received at DAU via Audio Loop)	Optional, up to 4 auxiliary messages can be initiated at the ACU for broadcast to Orator II System, each message is 16 seconds in duration, used for applications like: Bomb alert Day to day timed routine announcements To call all faithful to prayer Class change announcement (use in schools and colleges) see ACU data sheets
Entertainment system	The Orator II System can connect to an entertainment system to allow broadcast of background music as a low priority task.
Emission	BS EN50081-1:1992 Part 1 Residential, Commercial & Light Industry Class B limits
Electrostatic discharge immunity	IEC 801-2 Level ± 8KV - air discharge ± 6KV - contact discharge

Radio Frequency Interference (assuming EMC complaint cable used)	
Radiated immunity	80MHz - 1GHz (DD ENV50140:1994) 10V/m
Conductive immunity	150KHz to 100MHz (DD ENV50141:1994) 140dBuV
Transients immunity	IEC 801-4 Level ± 2KV
Surge immunity	Common Mode Surge immunity - 1KV input output lines Differential Mode and Common Mode surge immunity - 2KV mains line
Ingress Protection	IP40 estimated
Vibration	5 to 60Hz

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DAU Evacuate / Alert Message modules

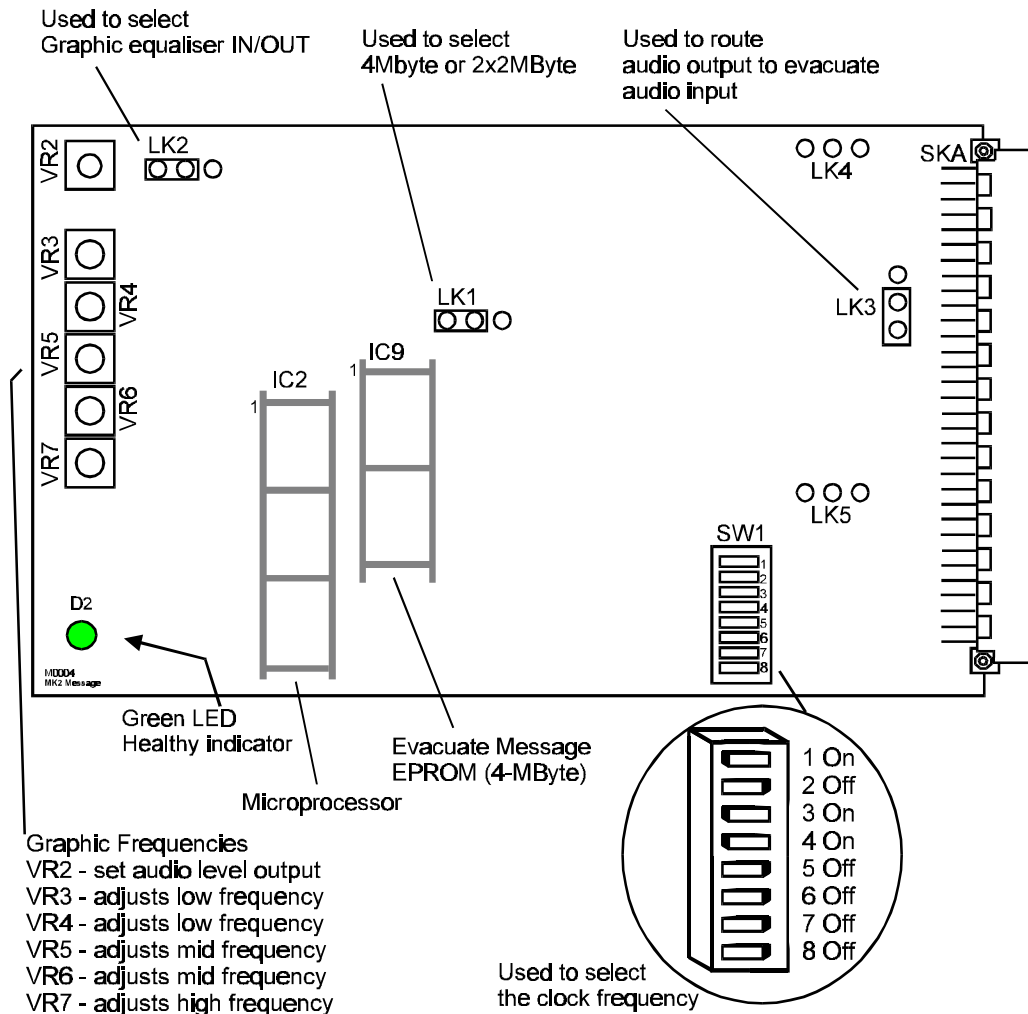


Figure 18-1 Evacuate or alert message card
cds10

- ☐ 13426-10 DAU Message store Evacuate module
- ☐ 13426-11 DAU Message store Alert module

These cards are evacuate and alert digital message stores, each capable of storing pre-recorded messages in a non volatile EEPROM.

The message reside in a 4-megabyte EEPROM (IC9). The message run continuously and is monitored at all times.

The output form the message store is passed via 5 band graphic equaliser to enable adjustment of the message to suit acoustic of the environment in which its speakers are installed. A level control sets the volume.

When the message is called by the **ACU** or **3400 Control panel** a reset is initiated which starts the message from the beginning.

13426-03 DAU Audio (highway) loop module

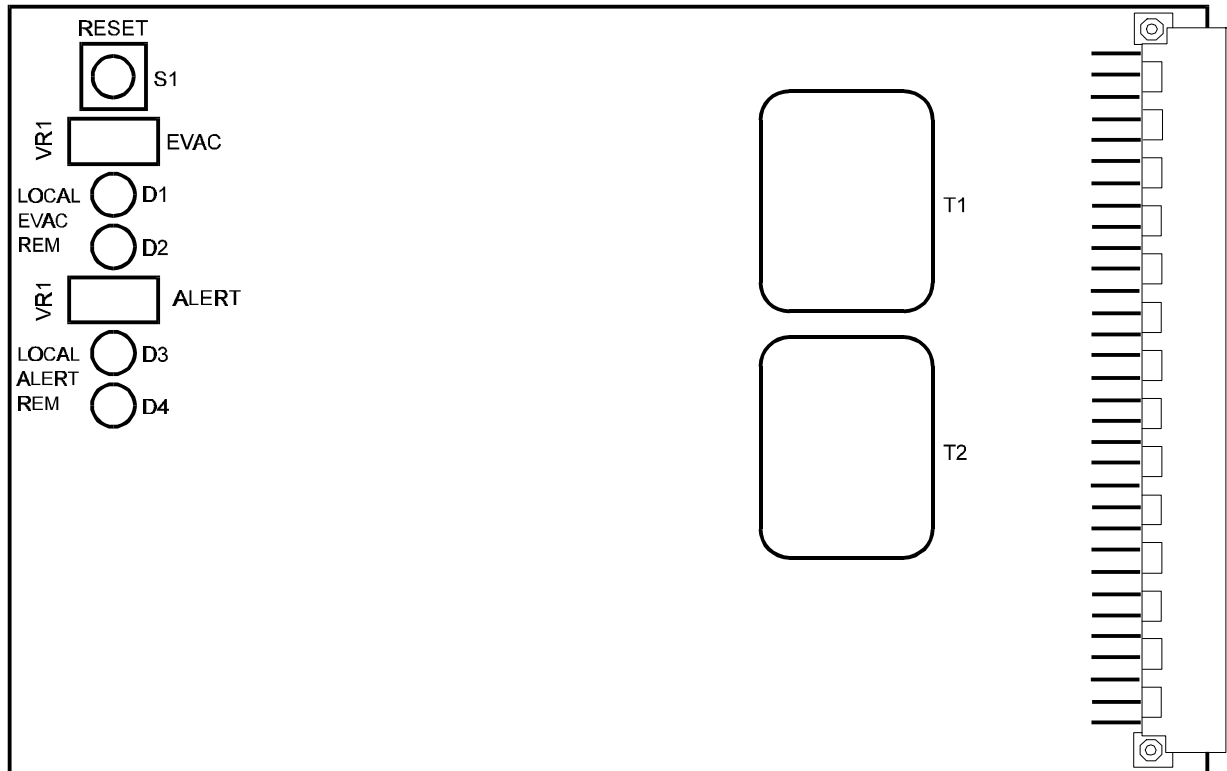
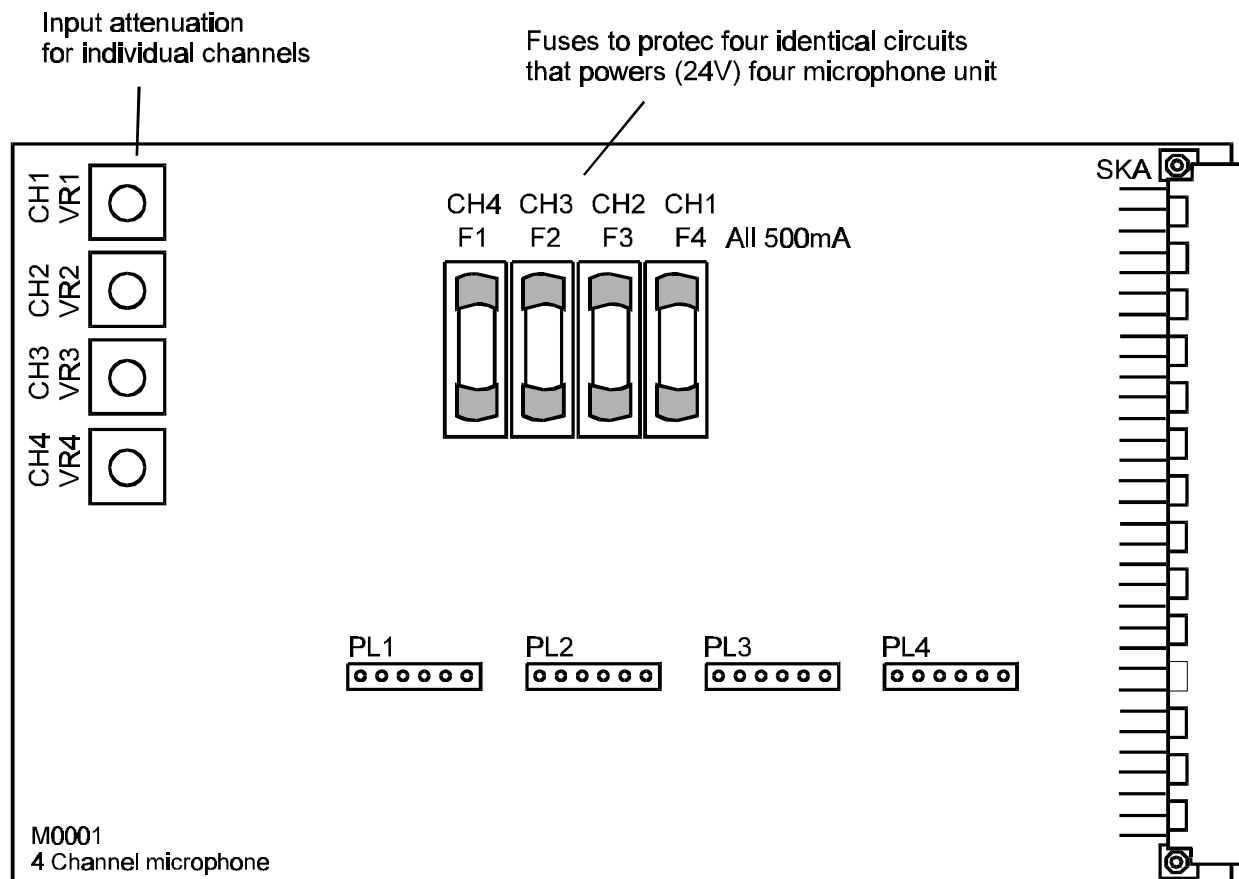


Figure 18-2 Audio highway card
cds15

This card is used when the DAUs are intended to be audio networked on a distributed processing basis.

The plug in module comprises of a 20KHz line surveillance detector (which monitors security of the network).

13426-05 DAU 4-Channel microphone module



DTMF Tone 1 - Zone 1
 DTMF Tone 2 - Zone 2
 DTMF Tone 3 - Zone 3
 DTMF Tone 4 - Zone 4
 DTMF Tone C - All Zones

Figure 18-3 Four channel microphone card
 cds14

This plug in module has four identical circuits and its function is to:

- ☐ provide a fused 24V d.c. supply to the local microphone unit
- ☐ a PTT key line
- ☐ and to accept and decode DTMF and audio speech signals from the 4-zone microphone unit.

13426-06 DAU Background music module

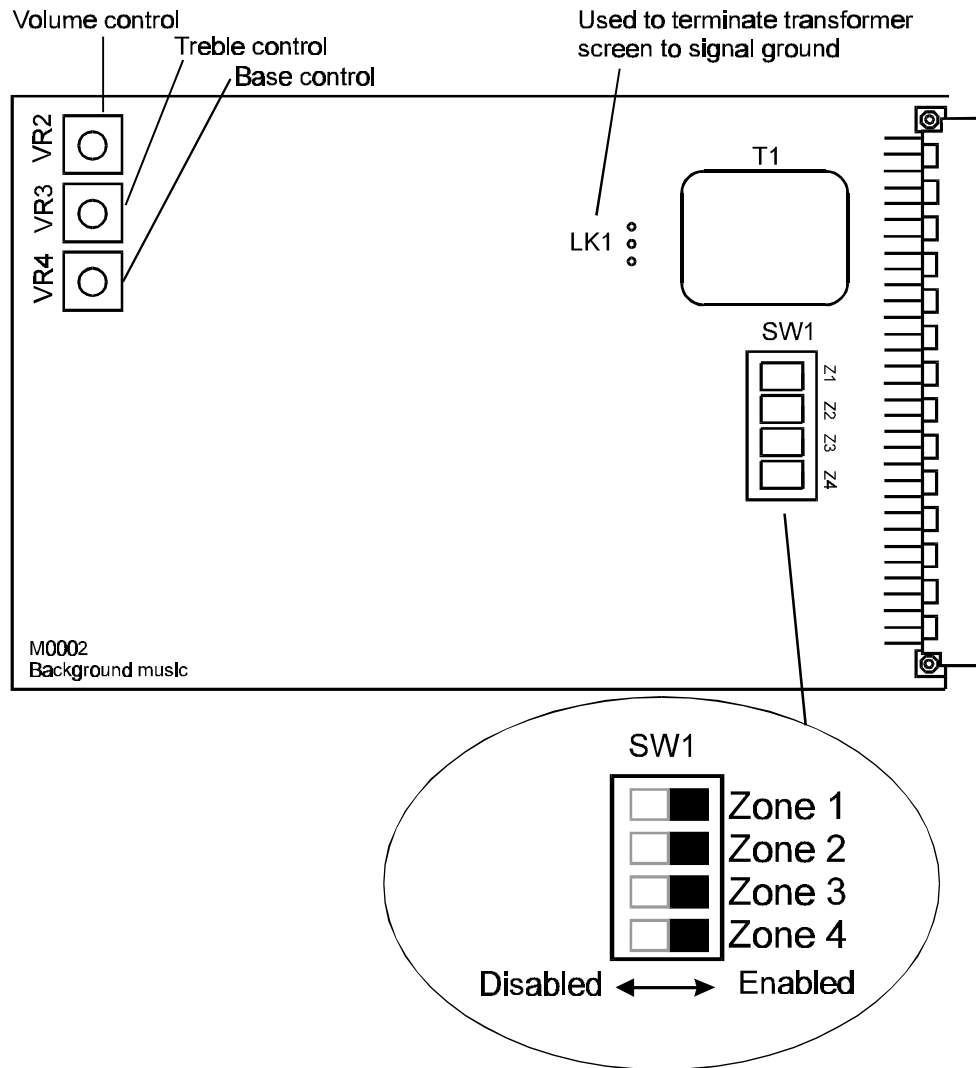


Figure 18-4 Background music card
cds13

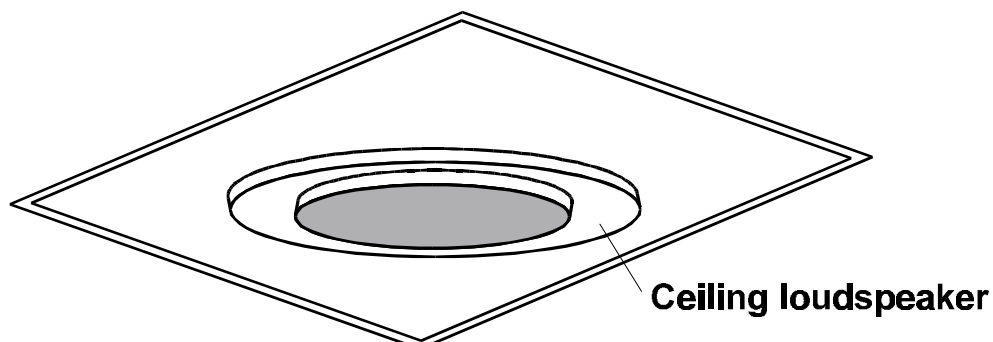
This plug-in card provides the interface between an external music source, connected via the music highway and the (low priority) output to the loudspeakers.

The module facilitates balance line input which is isolated by a balance transformer. Three controls are fitted - Volume, Bass and Treble to enable independent level frequency equalisation to be preset.

The module provides four audio outputs assign-able to any one zone, or all four zones, or any combination of zones.

13421-12 Orator 6W Ceiling loudspeaker

Figure 19-1 6W Ceiling speaker



cdm145

The 6 Watt loudspeaker is suitable for both voice alarm and general purpose public address applications, the unit is designed for flush fitting into suspended ceilings and is fitted with a rear dome.

The fixing arrangements allow the fire dome to be fitted and cables terminated prior to the fitting of the drive unit using a spring clip arrangement.

Options

- ☐ 13421-12 Orator 6W Ceiling loudspeaker (with fire dome)

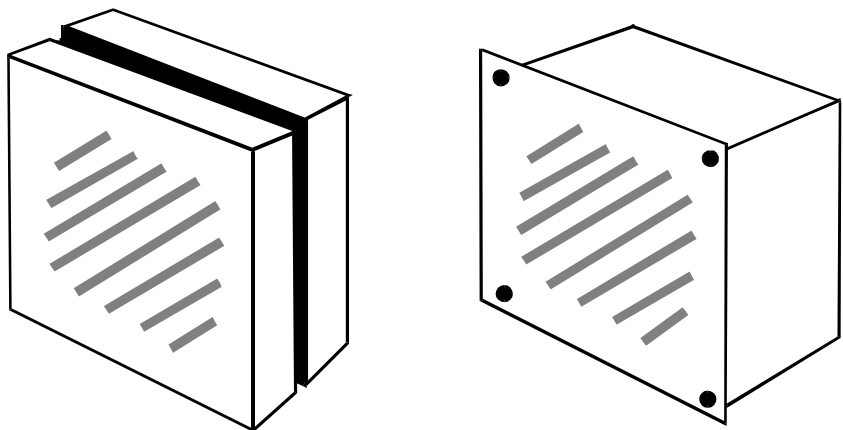
Specification

Size	230mm diameter x 125mm deep
Ceiling cut-out	185mm diameter
Colour	White
Weight	1.64Kg
Rated power	6Watts (100V line)
Power settings	0.75 / 1.5 / 3.0 / 6.0 Watts
Dispersion at 1KHz	120° conical
Usable frequency range	110Hz to 15KHz
SPL 1Watt @ 1m	98dB

13421-20/24 Orator 4W compact cabinet loudspeakers

Figure 19-2 4 W
Compact cabinet
speakers

cdm146



The strong compact 4 Watt cabinet loudspeaker are ideal for voice alarm use in areas where there is a risk of tampering or vandalism. The surface mounting steel case can be used in either wall or ceiling positions. A flush fixing version is also available in a zintec back box for in - wall use.

Options

- ☐ 13421-20 Orator 4W Cabinet loudspeaker (surface mount)
- ☐ 13421-21 Orator 4W Cabinet loudspeaker (flush mount)

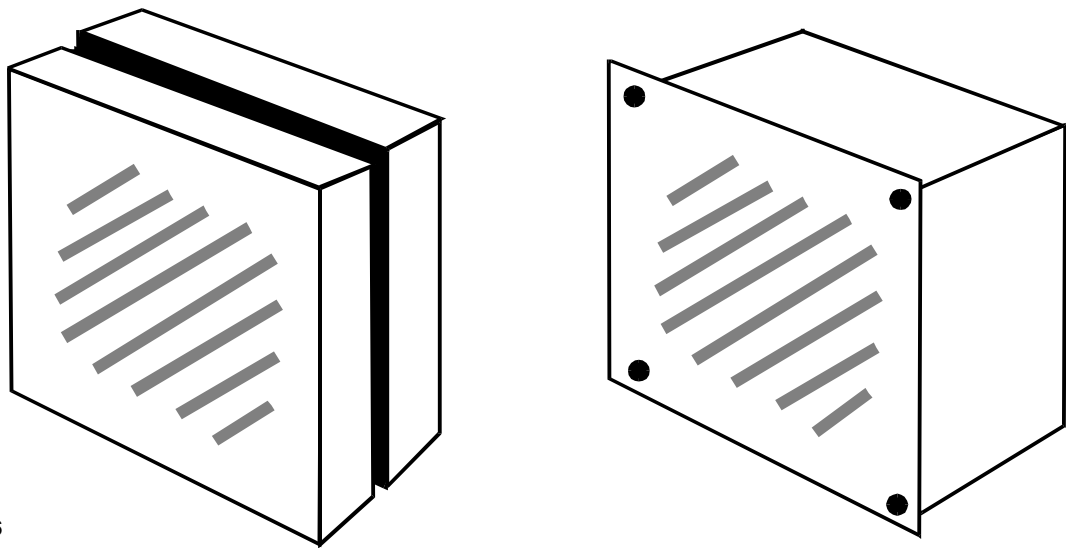
Specification

Size	Surface 120mm(wide) x 120mm(height) x 92mm(deep)
	Flush 120mm(wide) x 120mm(height) x 91mm(deep) (100mm(wide) x 100mm(height) x 90mm (deep) flush box)
Colour / material	White RAL 9010, epoxy coated mild steel zintec steel flush box
Mounting	6mm holes in back of box
Weight	1.98Kg surface 1.6Kg flush
Rated power	4Watts (100V line)
Power settings	0.5 / 1.0 / 2.0 / 4.0 Watts
Dispersion at 1KHz	120° conical
Usable frequency range	120Hz to 10KHz
SPL 1Watt @ 1m	87dB
Q factor	0.224

13421-21/25 Orator 6W cabinet loudspeakers

Figure 19-3 6W
Cabinet speakers

cdm146



The strong 6 Watt cabinet loudspeaker are ideal for voice alarm use in areas where there is a risk of tampering or vandalism. The surface mounting steel case can be used in either wall or ceiling positions. A flush fixing version is also available in a zintec back box for in - wall use.

Options

- ☐ 13421-21 Orator 6W Cabinet loudspeaker (surface mount)
- ☐ 13421-25 Orator 6W Cabinet loudspeaker (flush mount)

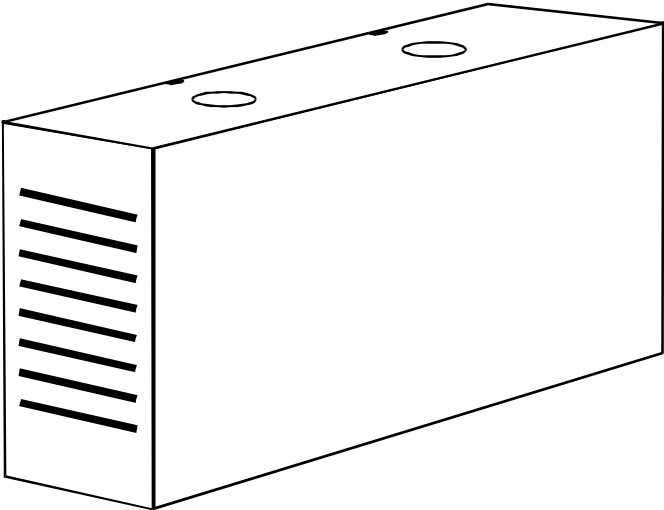
Specification

Size	Surface 190mm(wide) x 190mm(height) x 82mm(deep) Flush 190mm(wide) x 190mm(height) x 83mm(deep) (180mm(wide) x 180mm(height) x 82mm (deep) flush box)
Colour / material	White RAL 9010, epoxy coated mild steel zintec steel flush box
Mounting	6mm holes in back of box
Weight	1.98Kg surface 1.6Kg flush
Rated power	6Watts (100V line)
Power settings	0.75 / 1.5 / 3.0 / 6.0 Watts
Dispersion at 1KHz	120° conical
Usable frequency range	110Hz to 12KHz
SPL 1Watt @ 1m	97.5dB
Q factor	0.439

13421-30 Orator 6W Bi-directional loudspeaker

Figure 19-4 6W
Bi-directional speaker

cdm147



This is a robust surface mounting, twin loudspeaker unit specifically designed to provide coverage in corridors and passageways or other similar locations where a wide spread of sound is required.

The use of elliptical rather than round drive units permits the steel cabinet to be kept relatively shallow and unobstructive.

Options

- ☐ 13421-30 Orator 6W Bi-directional loudspeaker

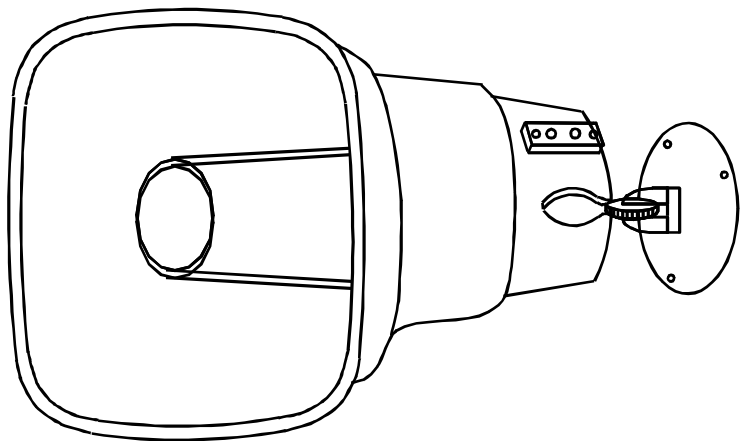
Specification

Size	Surface 204mm(wide) x 134mm(height) x 86mm(deep)
Colour	White RAL 9010, epoxy coated mild steel
Weight	2.0Kg
Rated power	6 Watts (100V line)
Power settings	1.5 / 3.0 / 6.0 Watts
Dispersion at 1KHz	120° x 60° (vertical x horizontal) when wall mounted
Usable frequency range	150Hz to 12.5KHz
SPL 1Watt @ 1m	87dB

13421-40 Orator 15W re-entrant Horn loudspeaker

Figure 19-5 15W re-entrant horn speaker

cdm148



This medium power metal horn loudspeaker with a high degree of weather protection making is suitable for most industrial and external applications.

Options

- ☐ 13421-40 Orator 15W Horn loudspeaker IP67

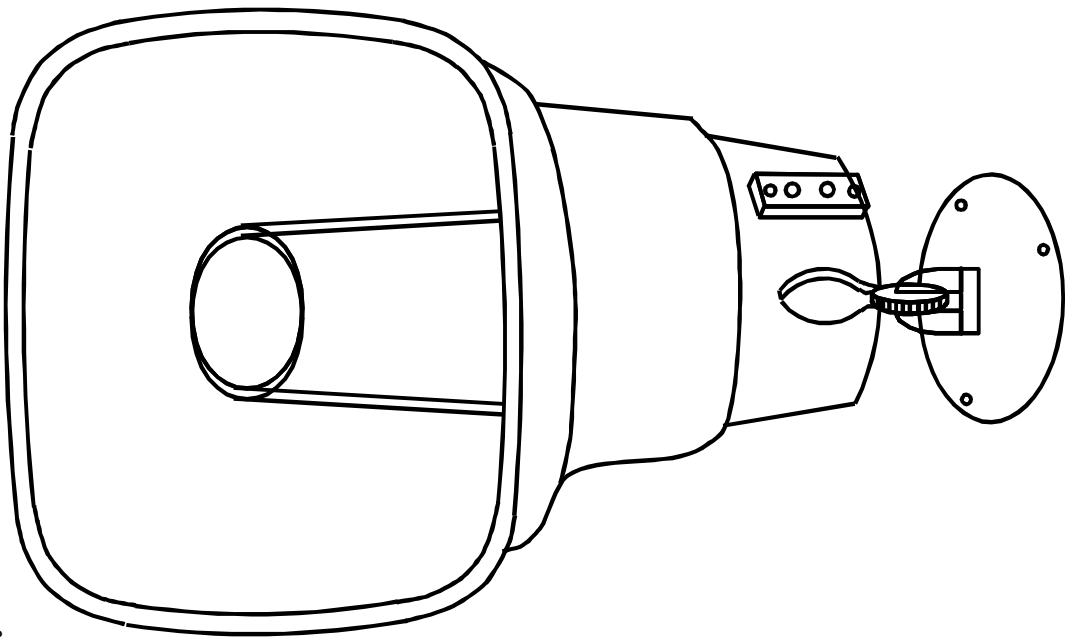
Specification

Size	203mm(wide) x 203mm(height) x 229mm(deep)
Colour	Grey, epoxy coated aluminium
Mounting	Omni-directional swivel bracket
Protection	IP67
Weight	1.7Kg
Rated power	15 Watts (100V line)
Power settings	2.5 / 5.0 / 7.5 / 10.0 / 15.0 Watts
Dispersion at 1KHz	110° conical
Usable frequency range	275Hz to 14KHz
SPL 1Watt @ 1m	103dB

13421-41 Orator 30W re-entrant Horn loudspeaker

Figure 19-6 30W
re-entrant Horn
speaker

cdm148



This metal horn loudspeaker with a high degree of weather protection making is suitable for most industrial and external applications.

Options

- ☐ 13421-41 Orator 30W Horn loudspeaker IP67

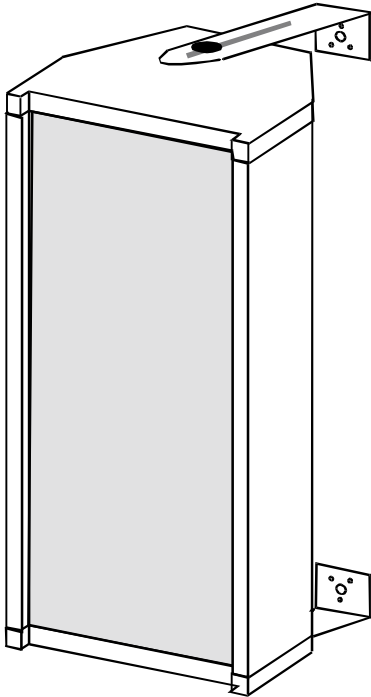
Specification

Size	254mm(wide) x 254mm(height) x 267mm(deep)
Colour	Grey, epoxy coated aluminium
Mounting	Omni-directional swivel bracket
Protection	IP67
Weight	3.0Kg
Rated power	30 Watts (100V line)
Power settings	5.0 / 10.0 / 15.0 / 20.0 / 30.0 Watts
Dispersion at 1KHz	100° conical
Usable frequency range	225Hz to 14KHz
SPL 1Watt @ 1m	107dB

13421-50 Orator 20W Column loudspeaker

Figure 19-7 20W Column speaker

cdm149



This metal cased, weather resistant column loudspeaker is ideally suited to voice alarm applications where some control of sound spread is necessary. Although intended primarily for good quality speech performance, they may also be used for background music, particularly as an alternative to limited music capabilities of re-entrant horns. The twin mounting brackets allow for easy adjustment in both horizontal and vertical planes.

Options

- ☐ 13421-50 Orator 20W Column loudspeaker

Specification

Size	147mm(wide) x 420mm(height) x 110mm(deep)
Colour	Light grey, epoxy coated aluminium
Mounting	Steel brackets
Weight	3.2Kg
Rated power	20 Watts (100V line)
Power settings	10.0 / 20.0 Watts
Dispersion at 1KHz	140° x 70° (horizontal x vertical)
Usable frequency range	200Hz to 14KHz
SPL 1Watt @ 1m	94dB

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Appendix A - Understanding decibels

There are two 'decibel' terms used in this manual.

dB

The dB is a multiplication factor expressed in a logarithmic form:

$$\text{dB} = 10 \log_{10} x \quad \text{where 'x' is the multiplication factor}$$

and expressed the other way around:

$$x = 10^{n/10} \quad \text{where 'n' is the multiplication factor expressed in dB}$$

If x is positive, the multiplication factor is greater than 1, eg +3dB = 2

If x is negative, the multiplication factor is less than 1, eg -3dB = 1/2

$$\text{note:} \quad -x \text{ dB} = 1/(+x \text{ dB})$$

The 'Power ratios' table on the previous page provides a cross-reference between the two.

Sound level is perceived by human beings on a logarithmic scale, and so decibels is a convenient way of describing it. The smallest increase in sound level that most people can perceive is 3 dB. A change of 10 dB will be perceived as a doubling or halving of sound level.

dB(A)

The dB(A) refers to an absolute sound (pressure) level. The reference point is based on the 'threshold of hearing'.

Thus 0 dB(A) = threshold of hearing, a sound pressure level of twice (x2) the threshold of hearing would be +3 dB(A). Product data sheets

Sound Pressure Levels

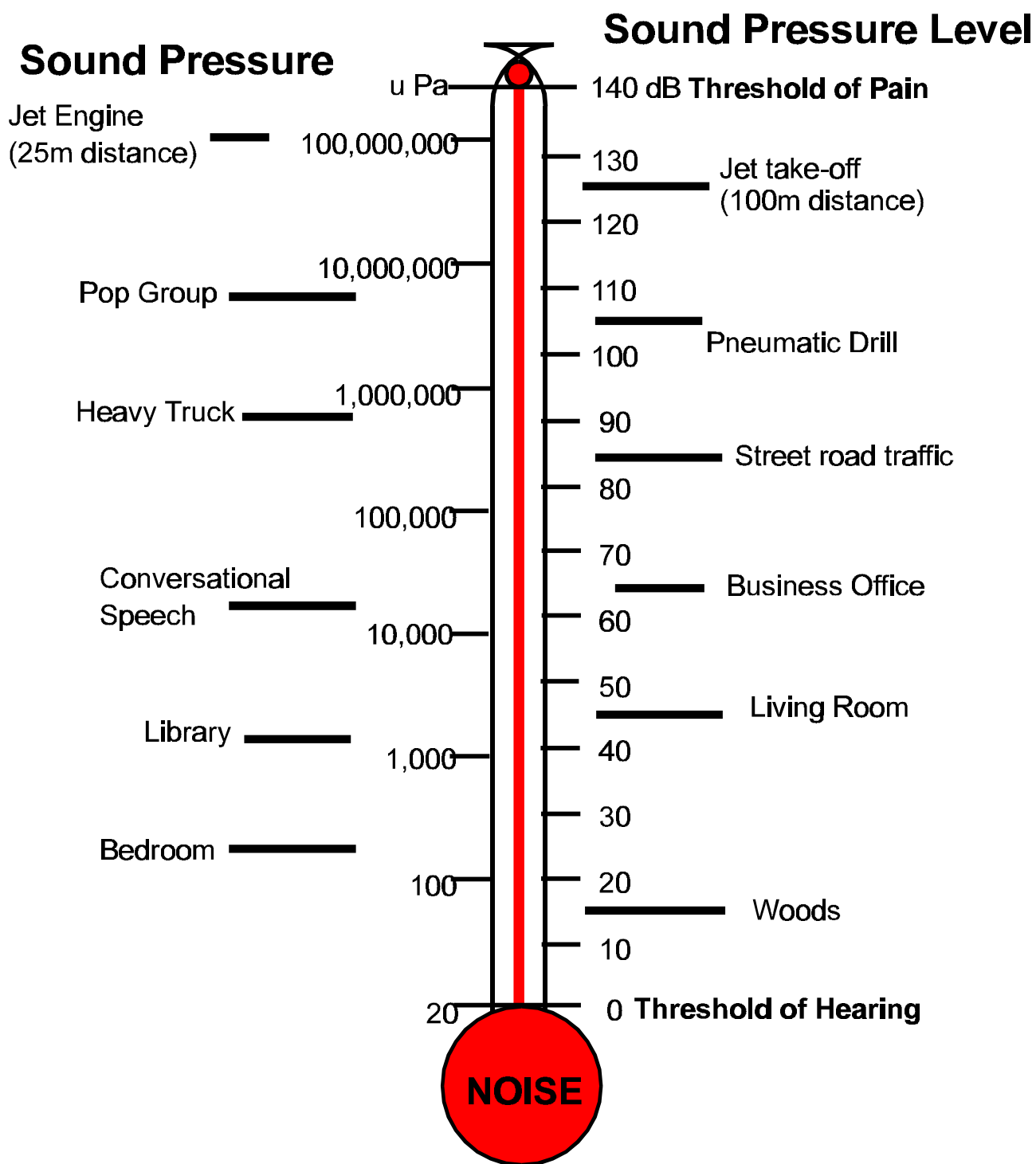


Figure A-1 Sound pressure levels
cdm165

Appendix B - Forms

The forms in this section may be of use when documenting the design of a voice alarm system.

The pages in this section may be photocopied to assist with the design work. The original pages should be left unmarked for future use.

System 3400-Orator II**Sheet 1 of 2**

Site name: _____ GENT Ref : _____

Address: _____ GENT Contact _____

Site contact name(s): _____

Telephone number: _____

Fax number: _____

GENT Part Number	Description	Quantity required	Single part cost	Total cost
13425-01	ACU Master 16 Zone			
13425-02	ACU Slave 16 Zone			
13425-20	ACU 16 Zone Extender set			
13425-25	ACU Slave interface			
13425-30	ACU Auxiliary message store			
13425-31	ACU 3400 Loop I/O module			
13425-32	ACU I/O Buffer board			
4015-514	Battery 12V 12Ah (for AUC)			
05795-38	Battery 12V 38Ah (for DAU)			
13426-01	DAU Base unit			
13426-02	DAU 3400Loop I/O module			
13426-03	DAU Audio loop module			
13426-04	DAU Message store (no message)			
13426-05	DAU 4-Channel microphone access module			
13426-06	DAU Background music module			
13426-10	DAU Message store Evac/Comms			
13426-11	DAU Message store Alert/Comms			
13426-30	Message EPROM Evacuate/comms			
13426-31	Message EPROM Alert/comms			
13426-50	Message EPROM custom			
13426-81	Amplifier module 2 x 50W c/w EOLs			
13426-82	Amplifier module 4 x 50W c/w EOLs			
13426-83	Amplifier module 2 x 100W c/w EOLs			
13426-84	Amplifier module 2 x 250W c/w EOLs			
13427-01	Orator EOL unit			
13427-04	DAU 4-Zone microphone unit			
13428-01	Mixer Preamp 6-I/P			
13428-02	Graphic equaliser			
13428-03	AM/FM Tuner			
13428-04	Cassette player Twin Deck			

Sub total (Sheet 1)

System 3400-Orator II

Sheet 1 of 2

Site name: _____ References: _____

GENT Part Number	Description	Quantity required	Single part cost	Total cost
13428-05	CD Player (10 disc)			
13428-06	Monitor panel			
13428-12	Rack, 12U for PA equipment			
13428-16	Rack, 16U for PA equipment			
13428-20	Rack, 20U for PA equipment			
13428-34	Rack, 34U for PA equipment			
13428-43	Rack, 43U for PA equipment			
13421-12	Orator 6W Ceiling speaker			
13421-20	Orator 4W Cabinet speaker			
13421-21	Orator 6W Cabinet speaker			
13421-24	Orator 4W Cabinet speaker flush			
13421-25	Orator 6W Cabinet speaker flush			
13421-30	Orator 6W Bi directional speaker			
13421-40	Orator 15W Horn speaker IP67			
13421-41	Orator 30W Horn speaker IP67			
13421-50	Orator 20W Column speaker IP55			
Sub total (sheet 2)				
Sub total (from sheet 1)				
Total				

Engineers notes:

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System 3400 Orator II

This section lists the commercially available parts for use in the System 3400 Orator II.

Audio Control Units

Options	13425-01	ACU Master 16 zone
	13425-02	ACU Slave 16 zone
ancillaries	13425-20	ACU 16 Zone extender set (includes control membrane and ribbons for use with Master or Slave ACU)
	13425-25	ACU Slave interface
	13425-30	ACU Auxiliary message store (for up to 4 message)
	13425-31	ACU 3400 Loop I/O module
	13425-32	ACU I/O Buffer board
	4015-514	Battery 12V 12Ah (but 2 required for DAU)

Distributed Amplifier Unit

DAU (un- populated)	13426-01	DAU base unit (includes case, power supply and mother board)
Boards	13426-02	DAU 3400 loop I/O card/module
	13426-03	DAU Audio (highway) loop card/module
	13426-04	DAU Message store, no message
	13426-05	DAU Local (4-channel) microphone card/module
	13426-06	DAU Background music card/module
	13426-10	DAU Message store (Evacuate/commission)
	13426-11	DAU Message store (Alert/commission)
Messages	13426-30	Message EEPROM (standard) Evacuate/Commission
	13426-31	Message EEPROM (standard) Alert/Commission

	13426-50	Message EEPROM Custom
Amplifier modules	13426-81	Amplifier module 2 x 50W c/w line transformers and end-of-line units
	13426-82	Amplifier 4 x 50W module c/w line transformers and end-of-line units
	13426-83	Amplifier 2 x 100W module c/w line transformers and end-of-line units
	13426-84	Amplifier 2 x 250W module c/w line transformers and end-of-line units
Spare and ancillaries	13427-01	Orator End-of-line unit
	13427-04	DAU Local 4-Zone microphone unit
	05795-38	Battery 12V 38Ah 1-off (but 2 required for DAU)

Public address ancillaries

Options	13428-01	Mixer preamplifier 6 Inputs (2U)
	13428-02	Graphic equaliser (2U)
	13428-03	AM / FM Tuner (1U)
	13428-04	Cassette player - twin deck auto reverse (3U)
	13428-05	CD Player - 10 disc capacity (3U)
	13428-06	Monitor panel to facilitate source set up (2U)
Racks	13428-12	Rack, 12U to accept PA equipment, pre-wired
	13428-16	Rack, 16U to accept PA equipment, pre-wired
	13428-20	Rack, 20U to accept PA equipment, pre-wired
	13428-34	Rack, 34U to accept PA equipment, pre-wired
	13428-43	Rack, 43U to accept PA equipment, pre-wired

Loudspeakers

13421-12	Orator 6W Ceiling speaker (with fire dome)
13421-20	Orator 4W Cabinet loudspeaker
13421-21	Orator 6W Cabinet loudspeaker

13421-24	Orator 4W Cabinet loudspeaker flush
13421-25	Orator 6W Cabinet loudspeaker flush
13421-30	Orator 6W Bi-directional loudspeaker
13421-40	Orator 15W Horn loudspeaker IP67
13421-41	Orator 30W Horn loudspeaker IP67
13421-50	Orator 20W IP55 Column loudspeaker
13427-01	Orator End-of-line (EOL) Unit

3400 panel cards

13430-11V3+	Local controller card V3+ (LCC)
13431-01V3	Loop processor card (LPC)
13433-01V3	1 - 4 Loop panel RAM card
13433-03V3	1 - 8 Loop panel RAM card
13501-01	Secure network card
13532-50	Universal I / O card V3
13532-53	Slave I/O card

Manuals

13499-30	System 3400-Orator II Installation manual
13499-32	System 3400-Orator II Operator's manual
13499-34	System 3400-Orator II Commissioning manual
13499-36	System 3400-Orator II Applications manual

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