# Qt Pro System Planning and Layout Guideline – Revision 4

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## Introduction

This document is designed to assist in the planning for Qt Quiet Technology™ soundmasking, paging and music playback. The system may be installed in virtually any size space, with the most common coverage areas including:

- Open Plan Office
- Private Offices and Conference Rooms
- Corridors and Hallways, Reception Areas, Restrooms
- Exam Rooms

The following pages include design guidelines utilized to reach the best possible performance characteristics from the Qt Pro Quiet Technology™ soundmasking products. Unlike many traditional audio systems, soundmasking requires a well-executed approach with minimal variation in frequency response of sound levels in order to achieve a “comfortable” experience. Following these guidelines carefully, along with proper calibration of a properly installed solution, will result a favorable, uniform, and consistent soundmasking experience for building occupants.

## Soundmasking Emitter Types

There are two different soundmasking emitter choices for consideration, both are direct field devices, meaning that they are mounted downward for direct unimpeded transfer of an audio signal to the listening location:

- Qt Emitter – A passive audio loudspeaker device suitable for soundmasking and limited output level paging applications. This emitter receives an amplified signal directly from the Qt Pro Control Processor via a UTP category cabling infrastructure. Maximum sound pressure levels with this type of emitter are 55 dBA at 1 meter, with a soundmasking frequency response of 200Hz to 6.3kHz.

- Qt Active Emitter – An active (self-powered) audio loudspeaker device suitable for soundmasking and paging/ background music environments. This emitter contains an internal amplifier which receives the audio signal directly from the Qt Pro Control Processor in addition to a DC voltage which powers the Qt Active Emitter device. Both power supply(s) and voltage injectors are required for operation in addition to the Qt Pro Control Processor. Maximum sound pressure levels with this type of emitter are 74 dBA at 1 meter with a soundmasking frequency response of 125Hz to 8 kHz.

## Qt Pro Control Processors

Soundmasking is generated and audio signals are distributed to emitters by the lineup of Qt Pro Control Processors. Three different sized Qt Pro Control Processors are currently available for use with Qt Emitters and Qt Active Emitters as follows:

- Qt 100 – a single zone control processor with Qty (1) audio input (Qt Emitters Only)
- Qt 300 – a three zone control processor with Qty (2) audio inputs (Qt Emitters and Qt Active Emitters)
- Qt 600 – a six zone control processor with Qty (2) audio inputs (Qt Emitters and Qt Active Emitters)

Each zone consists of up to two cable runs for connection of emitters utilizing standard UTP category plenum cabling. Additionally, each zone contains four non correlated soundmasking signals to avoid interference of adjacent emitters (see Masking Channel section later in this document).

**NOTE:** The Qt 300/600 will support both Qt Emitters & Qt Active Emitters when operating Firmware 6.4 or later.

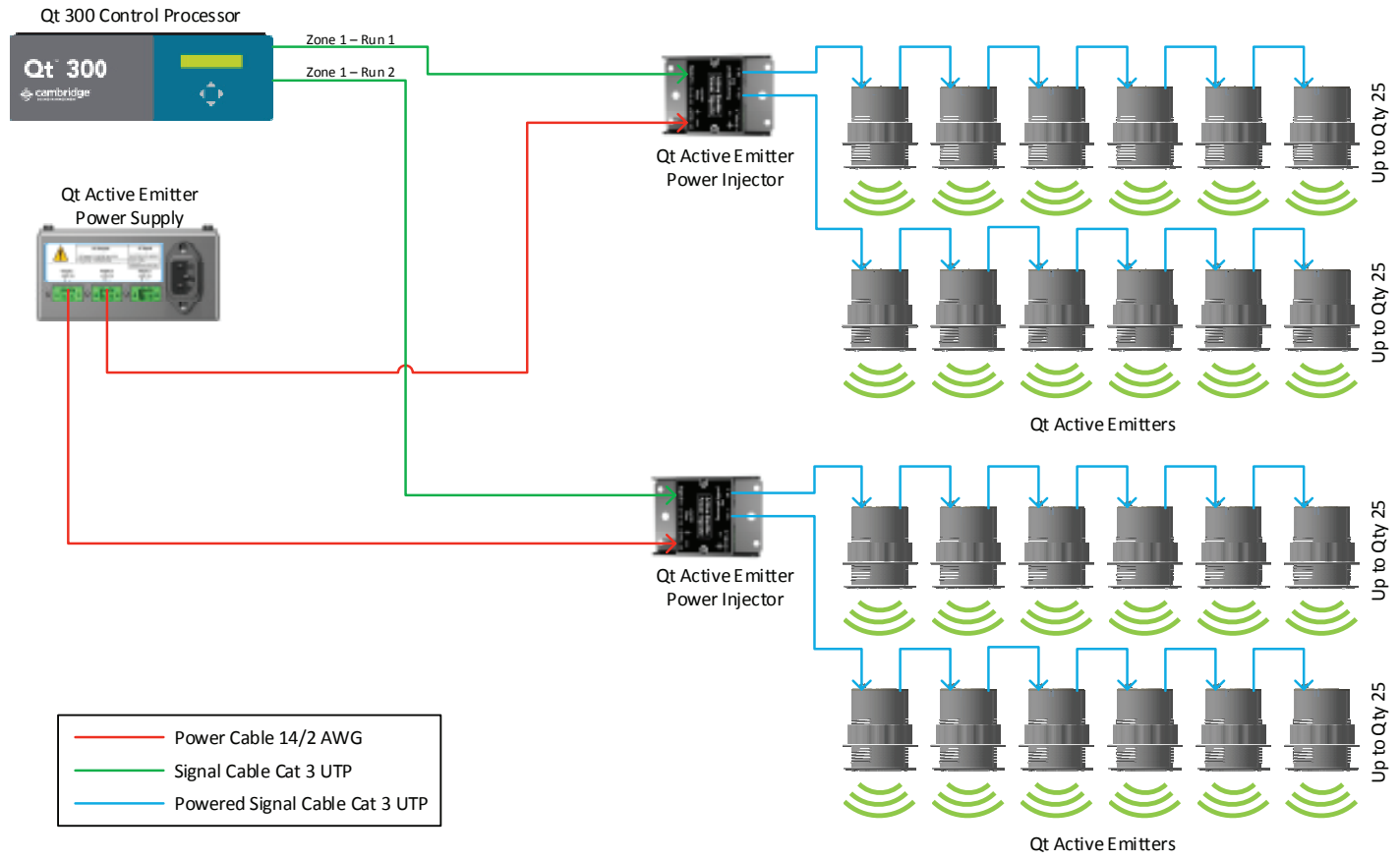
## Qt Active Emitter Components

Due to the onboard amplifier located inside each Qt Active Emitter, a power supply and power injector is required for operation. These following two accessories are designed for use with the Qt Active Emitter:

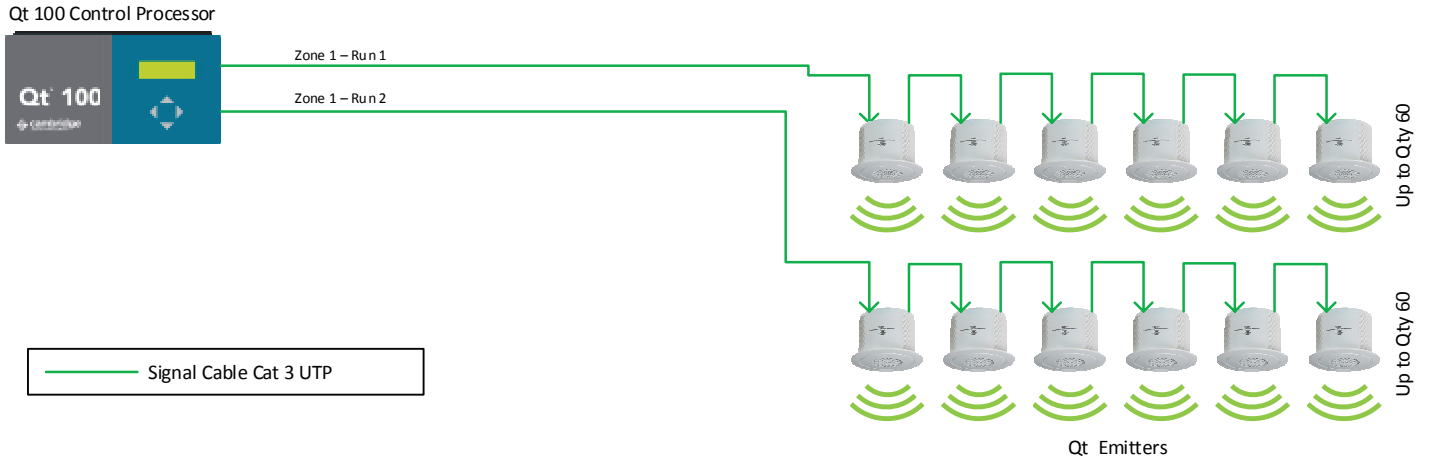
- Qt Active Emitter Power Injector – Capable of supporting up to Qty (2) emitter cabling strings of 25 Qt Active Emitters each. (50 Qt Active Emitters)
- Qt Active Emitter Power Supply – Capable of supporting up to Qty (3) Qt Active Emitter Power Injectors with a Qty (1) Injector per output port, for a total of Qty (150) Qt Active Emitters.

Power is distributed to the Qt Active Emitter from the power supply, via the power injector, where it is combined with the audio signal creating a Powered Signal-type cable. Cabling from Qt Control Processor to Injector utilizes the same Signal cable type as previous installations. A separate Power Cable runs from power supply to Injector.

## Qt Active Emitter - Single Zone Topology




## Qt Emitter - Single Zone Topology



## Cabling Types and Distances

The advantage to Qt masking systems over previous technology is the primary use of UTP four-pair, category type cabling with EIA/TIA 568B standard termination. Due to the environment in which most emitters are installed, CMP type cabling (plenum-rated cable) is supplied as standard by Cambridge Sound Management (CSM) and recommended for use throughout the system.

Home run cabling (typically supplied and cut to length in the field by the installer and also available through CSM) is a Signal Cable found between the Qt Control Processor and either to the first Qt Emitter in the cable run—or alternatively, the Qt Active Emitter Power Injector's signal input, in the case of an Qt Active Emitter zone.

Interconnect cables are utilized by both type of emitters and connect the output jack of a previous emitter to the input jack of the next, in a daisy-chain fashion. In the case of the Qt Active Emitter, these interconnects both carry DC voltages inserted at the Injector, and an audio signal from the Qt Control Processor making them a Powered Signal Cable-type. When using the standard Qt Emitter, each daisy-chained interconnect cables carry four channels of audio directly from the Qt Control Processor to the Qt Emitter as a Signal Cable.

There is a need for a different type of cable in the system infrastructure only in cases where the Qt Active Emitter is in use. The power cable is a 14 AWG two-conductor type CMP cable which delivers DC voltage from the Qt Active Emitter Power Supply to the Qt Active Emitter Power Injector.

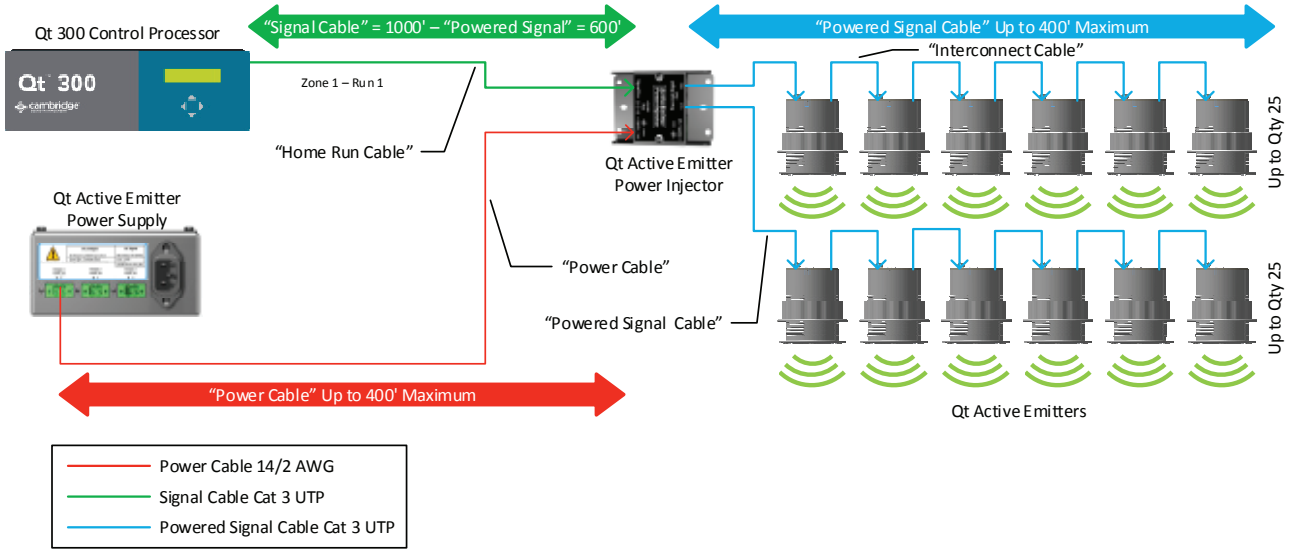
**Cabling Types and Maximum Distances**

| Cable | Cabling Type | Qt –Emitter (max distance) | Qt Active Emitter (max distance) |
|---|---|---|---|
| **Signal Cable**<br>West Penn 254245<br>Belden 1501A or Equivalent | Category 3,5,5e,6 / 4-Pair (8 conductor) 24 AWG Solid CMP | 1000ft from Control Processor to last Emitter | *1000ft from Control Processor to last emitter of longest pathway. (including Powered Signal Cable length) |
| **Powered Signal Cable**<br>West Penn 254245<br>Belden 1501A or Equivalent | Category 3,5,5e,6 / 4-Pair 24 (8 conductor) AWG Solid CMP | _ | 400ft from Injector Output to last Qt Active Emitter |
| **Power Cable**<br>West Penn 25226<br>Belden 6100UE or Equivalent | 14 AWG, 2 Conductor Stranded CMP | _ | 400ft from Power Supply to Injector Input |
| **Maximum Number of Emitters** | _ | Qty 60 per cable run<br>Qty 120 per zone total | Qty 25 per Injector Output<br>Qty 50 per Injector<br>Qty 100 per Zone (requires 2 injectors) |

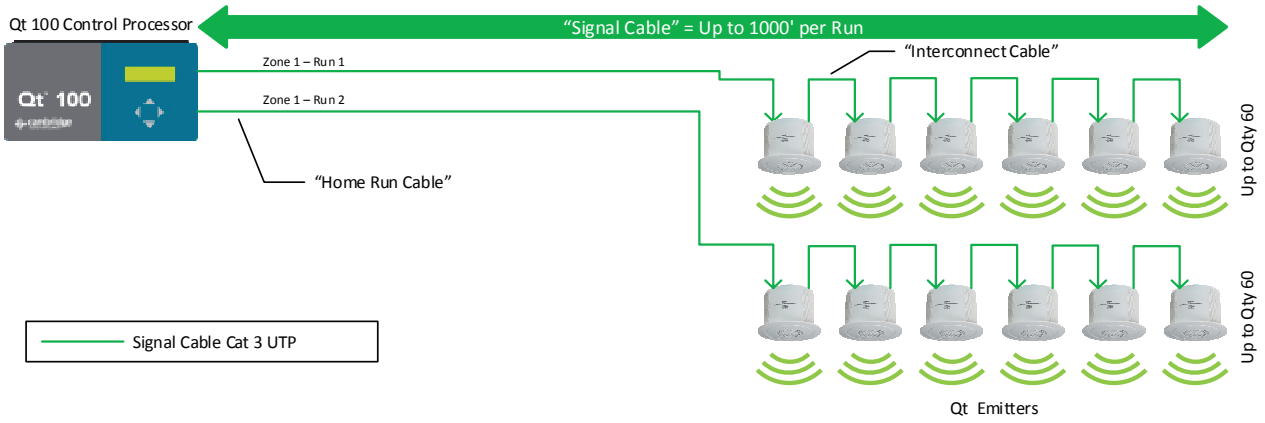
*Signal Length = 1000ft (-) longest "Powered Signal" length.

Table 1

## Qt Active Emitter - Maximum Cabling Distances




## Qt Emitter - Maximum Cabling Distances



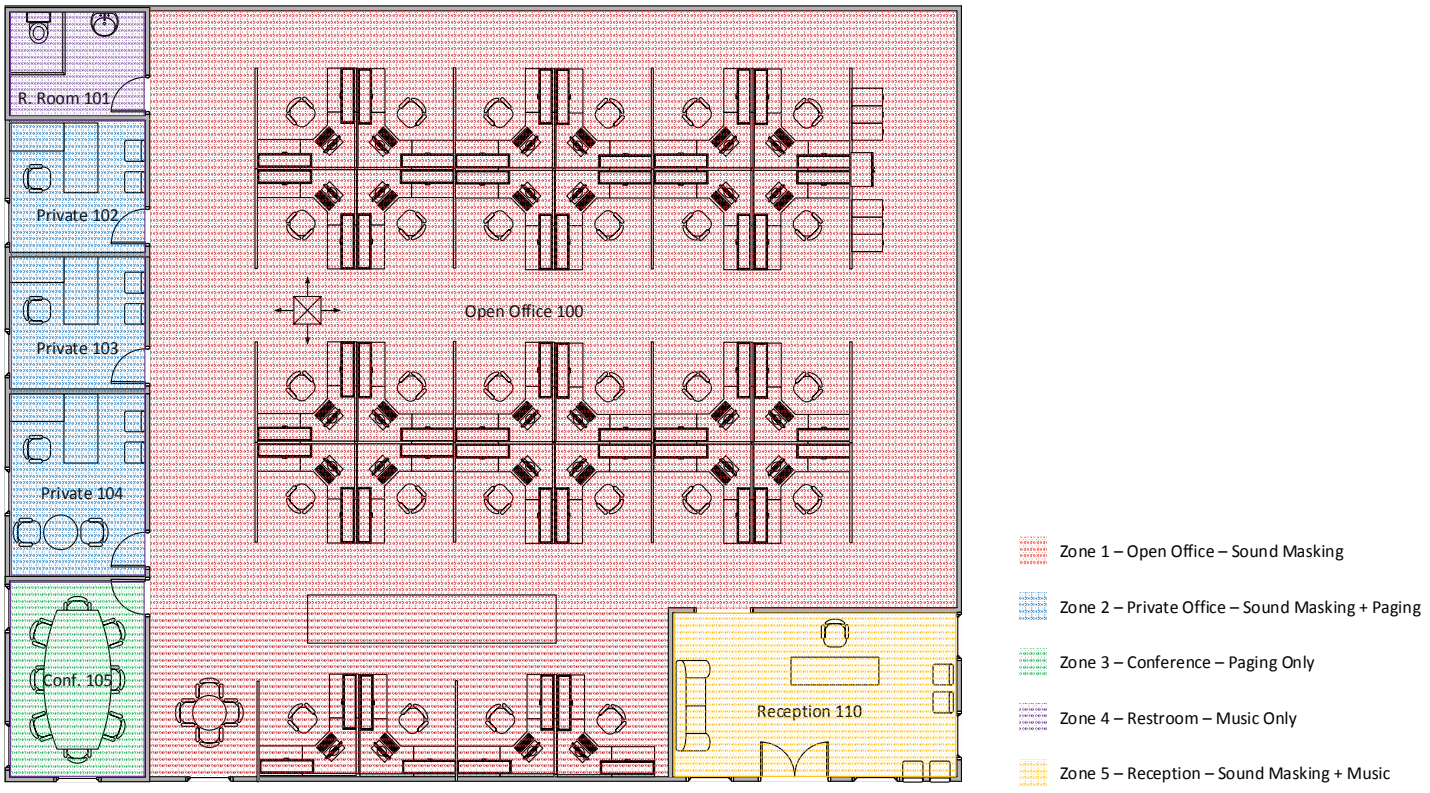
## System Zoning

Zoning is determined by the function of the space being served by soundmasking as well as ceiling height. For example, separate zones are used for open offices, private offices, and corridors, due to their requirement for different soundmasking volumes.

Another decision point for the number of zones required are areas that require other audio sources (i.e., paging/music). The audio input(s) feature an audio adjustment on each zone that allow audio source(s) to be tailored to any specific (or combination of) zones in order to meet the client's needs.

In cases where ceiling height variations of greater than 6" occur, multiple zones are required within the same functional space to guarentee consistent soundmasking signal. For example, in a single open office has one area with  acoustic ceiling tiles at a height of 9'8" and one area of drywall soffit at 9', the installer must place the emitters in two runs, with each placed to serve separate zones. This separation allows adjustment of soundmasking levels at the listener location based on emitter distance.

As a rule, soundmasking zones should begin and end at physical boundaries whenever possible. This means that coverage of a space should extend from wall-to-wall, which eliminates areas where occupants can exit and enter soundmasking within the same space. Failure to follow this guideline will often lead to occupant complaints due to the audible shift from "masked" to "non-masked" environment.




**Example Zoning Plan – Office Enviroment**

## Large Space/Open Office Emitter Spacing

Emitters are typically placed in ceiling materials in a consistent square/rectangular grid pattern, with the ultimate goal of providing uniform sound coverage throughout a space. In cases where an open ceiling or partial ceiling exists, optional brackets allow for constant height attachment to wood or structural steel and flush mounting in solid surfaces such as drywall or wood panels. Both the Qt Emitter and Qt Active Emitter require the same device spacing, which is determined based on ceiling/mounting height.

The Qt Emitter and Qt Active Emitter have the same minimum and maximum emitter spacing requirements from acoustic boundaries such as walls or columns. If a device is too close or too far away from a boundary, a change in sound level will be clearly discernable by occupants, which should be avoided at all costs.

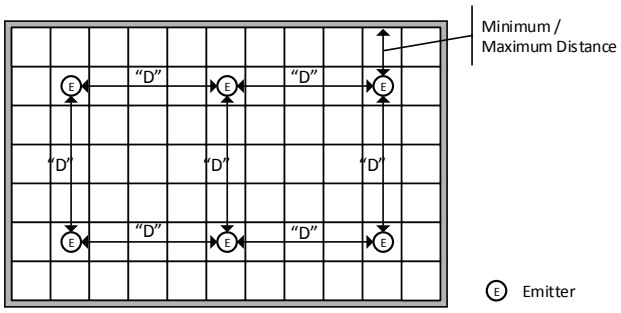
In the case where an in-ceiling conflict occurs (i.e., a light fixture, exit sign, sprinkler head), it is permissible to move an emitter up to 2 ft. in any direction to avoid the conflict. However, to ensure that the most consistent spacing possible is achieved, follow these guidelines to keep variations to a minimum:

- Qt Emitter – Square/Rectangular grid pattern with spacing determined by mounting/ceiling height
- Qt Active Emitter – Square/Rectangular grid pattern with spacing determined by mounting/ceiling height
- Emitters – Minimum distance of 2ft from any sound reflecting surface
- Emitters – Maximum distance of D ÷ 2 from any sound reflecting surface
- Emitters – Ability to move any single emitter 2’ in any direction to avoid a ceiling conflict

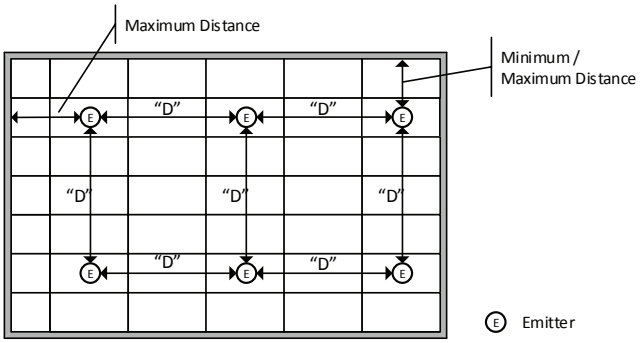
**Open Area Emitter Spacing Requirements**

| Emitter Mounting (Ceiling) Height | Qt Emitter & Qt Active Emitter Spacing, “D” (ft) 2x2 ACT, Open, or Solid Surface Ceilings | Qt Emitter & Qt Active Emitter Spacing, “D” (ft) 2x4 ACT Ceilings | Minimum Distance to Wall/Obstacle | Maximum Distance from Wall/Obstacle | Maximum Movement Distance to avoid a conflict. |
|---|---|---|---|---|---|
| **<8’ to 9’** | 8’ x 8’ | 8’ x 8’ | 2’ | 4’ | Up to 2’ in any Direction |
| **9’ to 10’** | 10’ x 10’ | 10’ x 8’ | 2’ | 5’ | Up to 2’ in any Direction |
| **10’ to 11’** | 10’ x 10’ | 10’ x 8’ | 2’ | 5’ | Up to 2’ in any Direction |
| **11’to12’** | 12’ x 12’ | 12’ x 12’ | 2’ | 6’ | Up to 2’ in any Direction |
| **12’ to 14’** | 12’ x 12’ | 12’ x 12’ | 2’ | 6’ | Up to 2’ in any Direction |
| **14’+** | Call CSM | Call CSM | 2’ | 7’ | Up to 2’ in any Direction |

Table 2

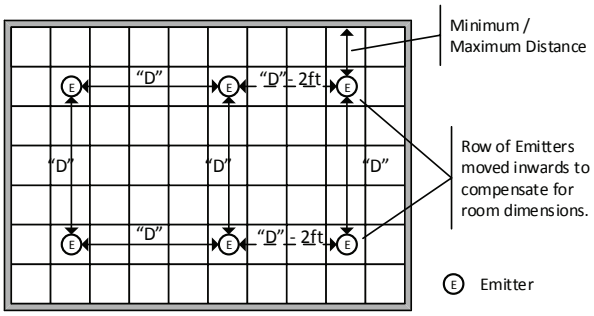



Standard Layout 2x2 Ceiling Tile

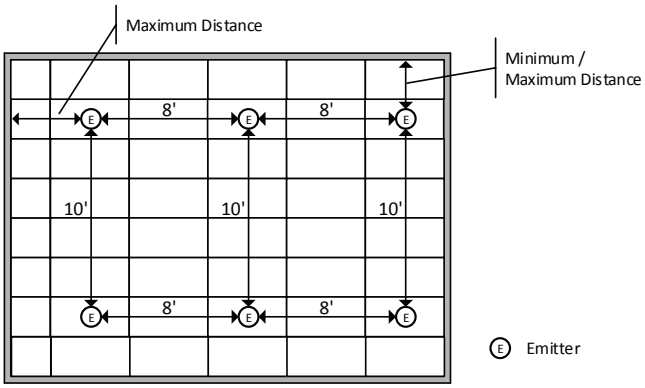



Standard Layout 2x4 Ceiling Tile

In many cases it will be necessary to adjust the last row or last several rows of emitters to compensate for room dimensions. In these cases, it is important to lessen the distance between emitters rather than increasing it, to maintain adequate coverage. For 2x2 ft. tiled ceilings this can be done by moving the emitter by one tile (-2 ft.) as shown in the example below.




Standard Layout 2x2 Ceiling Tile
w/ room dimension adjustment




10' x 8' Layout in 2x4 Ceiling Tile

Due to aesthetic concerns, it is often desirable to keep the emitter location centered in the ceiling tile. In the example above, a 10x8 ft. grid is used in 2x4 ft. ceiling tiles to accomplish this goal. This approach may be used in cases where ceiling height would allow for 10x10 ft. spacing but the aesthetic impact is objectionable.

## Enclosed Rooms/Private Offices Emitter Spacing

Enclosed offices and most smaller enclosed spaces require a minimum of two emitters per space (i.e., two channels of soundmasking) to prevent listeners within the space from focusing on a single emitter location. The number of emitters for such spaces can easily be determined utilizing the table below.

**Number of Emitters in a Small Enclosed Area**

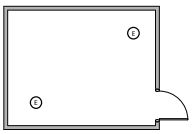
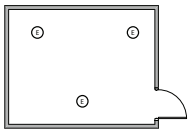
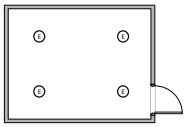
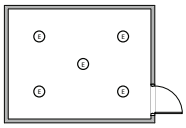
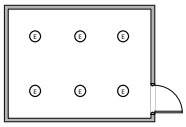
| Enclosed Area (Sqr ft.) | Number of Emitters | Recommended Layout |
|---|---|---|
| **Up to 180** | 2 |  |
| **180 to 260** | 3 |  |
| **261 to 340** | 4 |  |
| **341 to 420** | 5 |  |
| **420 to 500** | 6 |  |
| **Greater than 500** | Use Large Area / Open Office Guidelines | |

Table 3

## Telephone Rooms/Exam Rooms/Mothers Rooms Emitter Spacing

It is permissible to install a single emitter in very small spaces to gain privacy where the duration of occupancy is limited and specific installation conditions can be met. Such spaces include dedicated Telephone Rooms in office environments or Exam Rooms in a clinic environment. A single emitter is acceptable means of coverage if the following statements are true:

1. Occupancy is typically less than 1 hour per visit.
2. The area of room is less than or equal to the room size below based on ceiling heights.
3. A dedicated zone is used for a use similar to a single-emitter room, which allows for adequate adjustment.

**Acceptable Use of a Single Emitter for Coverage**

| Ceiling Height | Maximum Room Size | Sound Masking Exposure Duration | Use of Single Emitter |
|---|---|---|---|
| 8’ to 9’ | < 64 Sqr Ft. | Less than 1 Hour | OK |
| 9’to 11’ | < 100 Sqr Ft. | Less than 1 Hour | OK |
| 11’ to 14’ | < 144 Sqr Ft. | Less than 1 Hour | OK |
| Above 14’ | Call CSM | Less than 1 Hour | OK |

Table 4

In cases where the time duration of exposure, the room size exceeds the recommended ceiling height, or the emitter location is offset due to ceiling conflicts, refer to Table 3 for multiple emitter placement.

## Training Rooms/Conference Rooms

As soundmasking is a primary means to limit speech intelligibility for distance listeners, some spaces are not conducive to soundmasking. Training rooms are an example of spaces which are designed for communication. Applying soundmasking inside these areas would make listening to a training or presenter much more difficult for attendees.

Another such example would be conference spaces which are large enough in size where intelligibility could suffer due to the distance from listener to talker, or one that uses technology such as audio/video conferencing systems. In the latter case, soundmasking signals may interfere with audio technologies, which makes it difficult for “far end” listeners to clearly understand the conversation under specific circumstances.

As a general rule of thumb, meeting, conference, and training rooms larger than 300 sq. ft. should not be included in the soundmasking plan unless one the two following exceptions applies:

- Control of soundmasking inside the space is afforded through 3rd party control (i.e., Crestron, AMX, Extron etc.) that includes a separate soundmasking zone per room. This will provide the ability to disable soundmasking during certain room configurations such as video conferencing.
- The room has a dedicated room volume control that allows the masking level to be reduced or disabled in cases where technology is deployed or distances are too great.

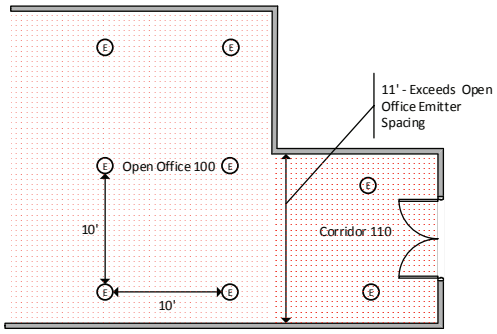
In cases where meeting rooms are adjacent, and wall construction allows conversations outside of the space to be easily overheard, soundmasking inside a training or conference room can be of great benefit. More importantly however, private conversations taking place inside a conference room should be protected by placing soundmasking outside of the space. Always place soundmasking where an unintentional listener is located to reduce distraction and increase privacy.

## Hallways/Corridor Area

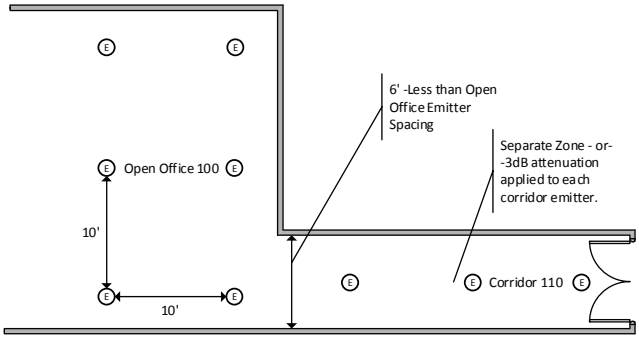
Emitter spacing in hallways and corridors should adhere to the same spacing standards as used for larger open offices, with the distance between emitters being based on emitter mounting/ceiling heights. Minimum and maximum distances from walls and other obstructions should also be maintained, as outlined for open space soundmasking deployment. (See Table 2.)

It is preferred that each hallway/corridor area be treated as a separate soundmasking zone to allow for independent level adjustment in most applications. This is especially important when adjoining areas of lower soundmasking levels such as private offices. An exception can occur however when open office spaces are connected to a hallway or corridor as follows:

1. When a wider hallway extends from an open office area, it is permissible to continue the open office zone into the hallway with no level adjustment. This may occur when hallway width is greater than the emitter spacing used for the open office.
2. In cases where hallway width is less than the emitter spacing used in the open office, the space should be either a separate zone, or have the DIP switch attenuation applied at the corridor emitters. Each corridor emitter can be attenuated downward -3 dB if ceiling heights/materials match and rear emitter DIP switches are used to compensate for the decrease level required.



Corridor - Single Zone Extension of Open Office



Corridor - Separate Zone from Open Office

## Intermixing Qt Emitter Types

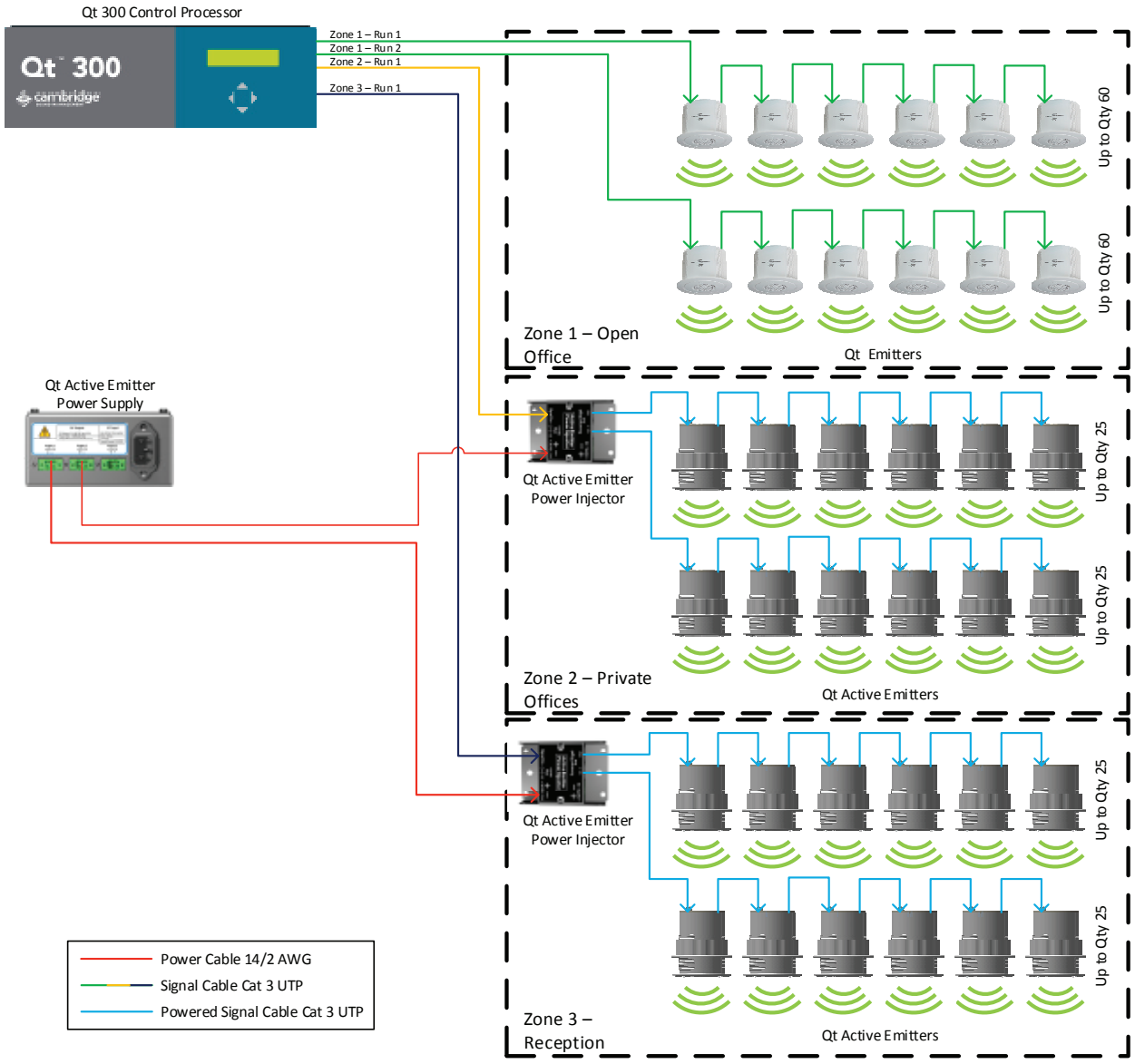
Both the Qt Emitter and Qt Active Emitter may be used on the same soundmasking project with signals supplied by a single Qt Control Processor if they are separated by zone. For example, a Qt 300 may supply soundmasking with Qt Emitters to an open office on Zone 1, while simultaneously supplying both soundmasking and paging to private offices with Qt Active Emitters on Zone 2. Additionally, Zone 3 can supply soundmasking and light music to a reception area with Qt Active Emitters.

At no time, should Qt Emitters and Qt Active Emitters be placed inside the same Control Processor zone.

Emitter type selection can be made on a zone-by-zone basis with the internal web browser interface provided by the Monitor Control Software (MCS) for the Qt 300/600 Control Processors.

The Qt Active Emitter can reproduce either a Standard or Active (lower frequency extension) soundmasking spectrum. The Qt Emitter is capable of reproducing only the Standard soundmasking spectrum. When differing types of emitters are used in adjacent zones, it is suggested that the Standard spectrum is used for both types of emitters, to closely match the sound signature heard by occupants throughout the facility. When all emitters installed on a project are the Qt Active Emitter type, either spectrum choice will provide the same speech privacy when adjusted to the same overall sound level.

## Qt Emitter & Qt Active Emitter - Three Zone Configuration



## Four Non-Coherent Soundmasking Channels

Each Signal Cable consists of Qty (4) non-coherent (i.e., different) soundmasking noise sources per output zone, with channels labeled as “A”, “B”, “C”, & “D”. By placing different noise sources directly adjacent to each other, comb filtering (i.e., acoustic interference) is alleviated. This is clearly beneficial when sitting an equal distance or walking between two emitter sources because this results in a very uniform and consistent soundmasking coverage.

The four soundmasking channels are unique to each Zone meaning that Channel A on Zone 1 is independent of Channel A on Zone 2 and can use completely different noise sources without concern for interference. However, these channels are not unique between the two cable run outputs on the Qt Control Processor and thus Channel A on Zone 1 Run 1 is the same audio source as Channel A on Zone 1 Run 2. When determining a wiring pathway, it is important to ensure two emitters with the same channel and zone designation are not adjacent.

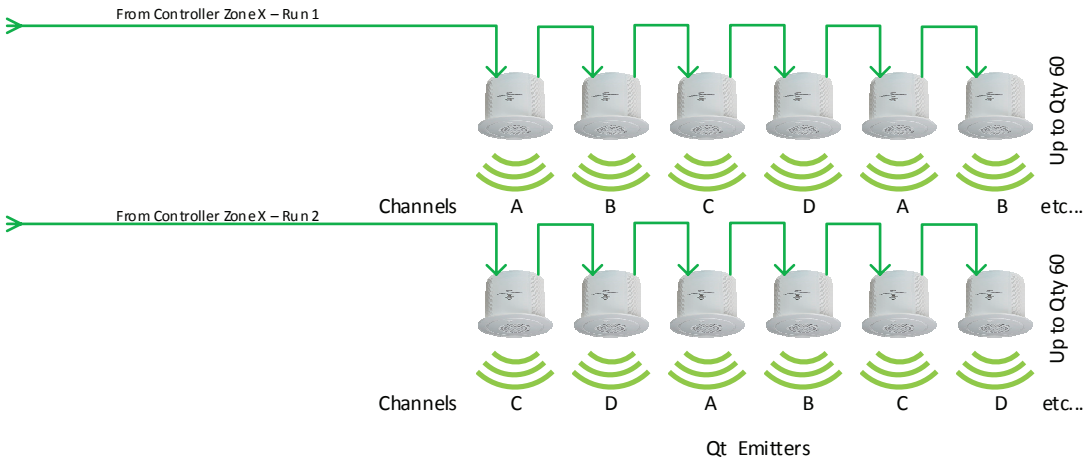
Both Qt Emitters and Qt Active Emitters automatically sequence through the four audio channels as they are connected, therefore alleviating the manual task of assigning a unique channel to each emitter.

When connected in a daisy-chain fashion, each channel automatically sequences to the next channel on the output jack of each emitter, with the Qt Control Processor channel beginning sequence as follows;

- Zone 1 – Run 1 = Channels A,B,C,D,A,B,C,D,A,B etc.
- Zone 1 – Run 2 = Channels C,D,A,B,C,D,A,B,C,D etc.
- Zone 2 – Run 1 = Channels A,B,C,D,A,B,C,D,A,B etc.
- Zone 2 – Run 2 = Channels C,D,A,B,C,D,A,B,C,D etc.
- Zone 3 – Run 1 = Channels A,B,C,D,A,B,C,D,A,B etc.
- Zone 3 – Run 2 = Channels C,D,A,B,C,D,A,B,C,D etc.
- Continues for all zones

The two channel offset between Run 1 and Run 2 allows two rows of emitters to begin near the Qt Control Processor and adjacent to one another, which minimizes home run cabling distances in many cases.

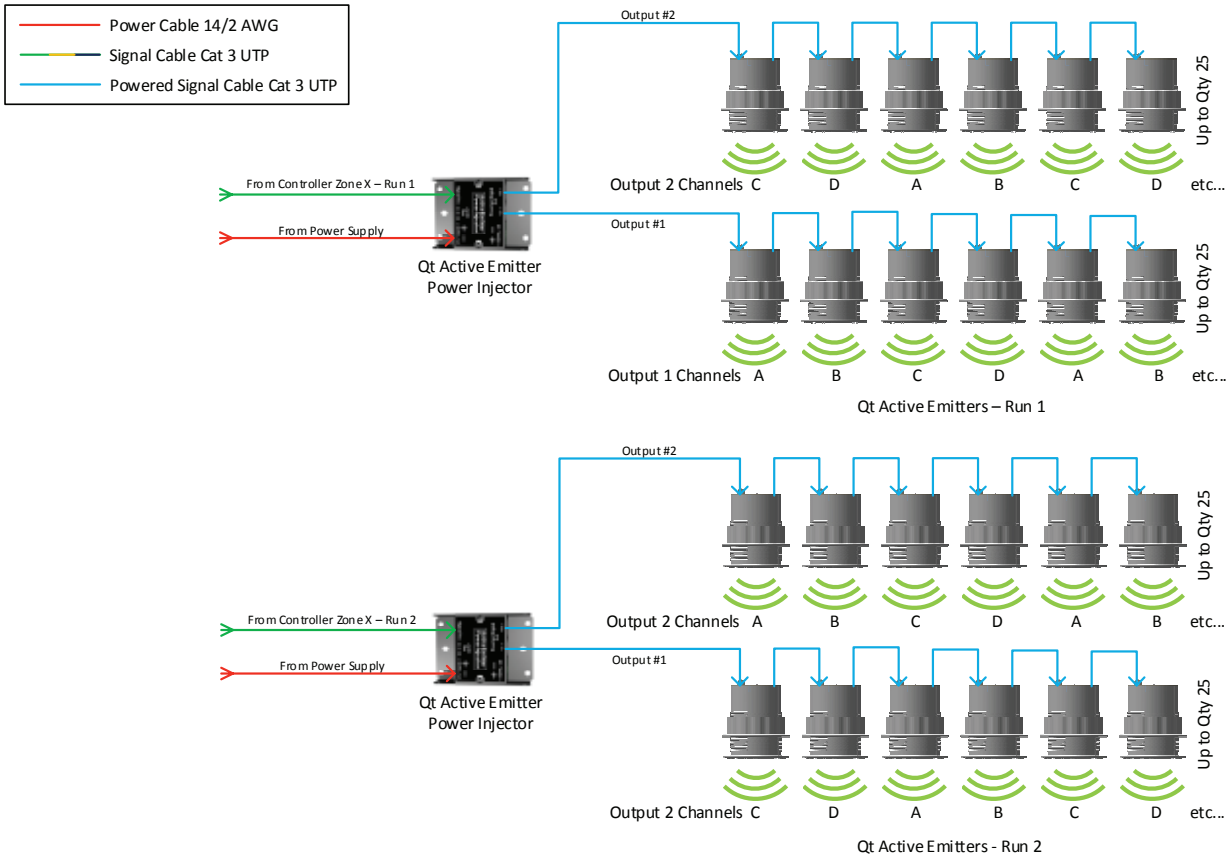
Qt Emitter Sound Masking Channel Sequence




**NOTE:** It is very important that the Input jack and Output jacks are correctly connected in order to maintain the channel sequence shown. Never swap the In/Out jacks when installing emitters.

When using the Qt Active Emitter and the associated Qt Active Emitter Power Injector two separate outputs are provided on the Injector. In order to facilitate the ability to start cable runs in adjacent rows of emitters, another channel offset is provided. Output 1 of the Injector utilizes the same channel sequence as the cable run from the Qt Control Processor, where Output 2 offsets those same channels by a sequence of 2 channels as follows:

- Zone 1 – Run 1 – Output 1 = Channels A,B,C,D,A,B,C,D etc.
- Zone 1 – Run 1 – Output 2 = Channels C,D,A,B,C,D,A,B etc.
- Zone 1 – Run 2 – Output 1 = Channels C,D,A,B,C,D,A,B etc.
- Zone 1 – Run 2 – Output 2 = Channels A,B,C,D,A,B,C,D etc.




**NOTE:** It is very important that the Input jack and Output jacks are correctly connected in order to maintain the channel sequence shown. Never swap the Input/Output jacks when installing emitters. Also of importance, observe the input and output jacks on the Injector at all times.

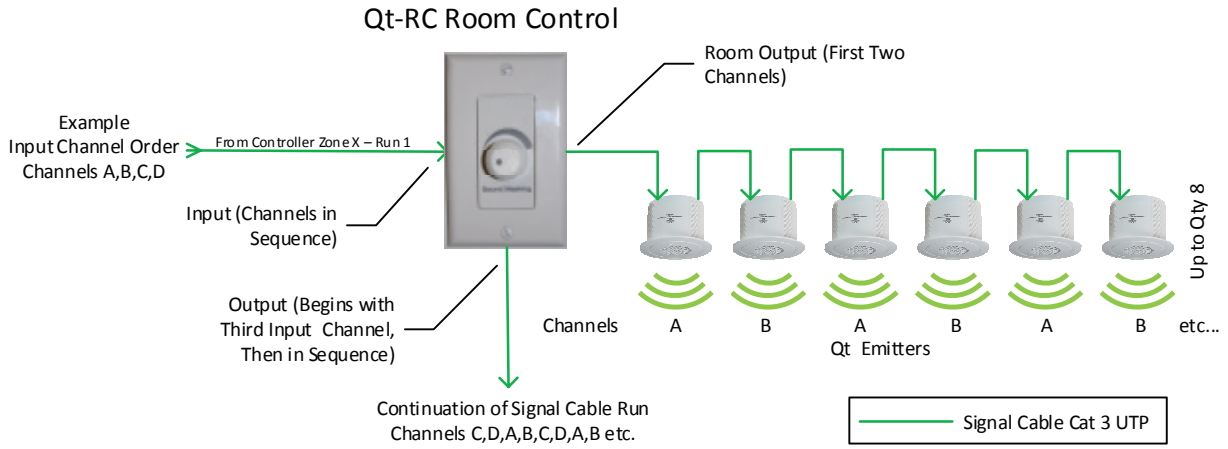
In all cases, the non-coherent channels pertain only to soundmasking sources and not to audio inputs such as paging and/or music. The audio inputs on the Controllers maintain four separate signal paths and sum the audio signal into a single coherent source at the Qt Control Processor.

## Qt-RC2 In Room Volume Control – Not Compatible with Qt Active Emitters

The Quite Room Control (Qt-RC2) offers local volume control of small rooms containing fewer than eight emitters. The Qt-RC2 allows five volume steps of approximately 2.5 dB per step each, with the final step being either -12.5 dB or “Off” (user-programmable setting done by a rear-position switch).

As the Qt-RC2 is a passive device for use with Qt Emitters only. Each Qt-RC2 counts against the maximum of 60 devices total alowed across the same run. For example, if Zone 1 Run 1 has a Qt-RC2 adjusting the level of Qty (6) Qt Emitters the remaining capacity would be Qty (53) additional devices (that is, 6 emitters + 1 Qt-RC2 = 7 devices; 60 devices per run – 7 = 53 remaining devices).

Each Qt-RC2 utilizes the first two input channels for the Room Output feeding local emitters under control. An Output jack allows the cable run to continue to additional areas which will be unaffected by the position of the Qt-RC2. The Output jack reorders the channel configuration for the next Input, beginning with the third Input channel, passing all four soundmasking channels in a repeating sequence for continuation of the run.




Qt-RC2 is compatible with Qt Emitters only and should never be used with Qt Active Emitters.

It is always best to provide zoned control in lieu of local control under most circumstances due to the fact that end user control of soundmasking is typically not advantageous (and often counterproductive to privacy and distraction goals). However, a Qt-RC2 is beneficial in situations where soundmasking needs to be disabled to administer hearing testing, or inside conference spaces with microphone technologies susceptible to acoustic interference.

Qt-RC2 should only be used when a situation warrants control and affects the level of all audio sources (masking, paging, music) simultaneously. By installing Qt-RC2 in private offices and therefore giving control of masking to occupants, the ability to “listen in” on a private conversation in an adjacent space will exist. Thus Qt-RC2 can have the unintended effect of decreasing acoustic privacy of neighboring spaces.

## Cabling Pathways

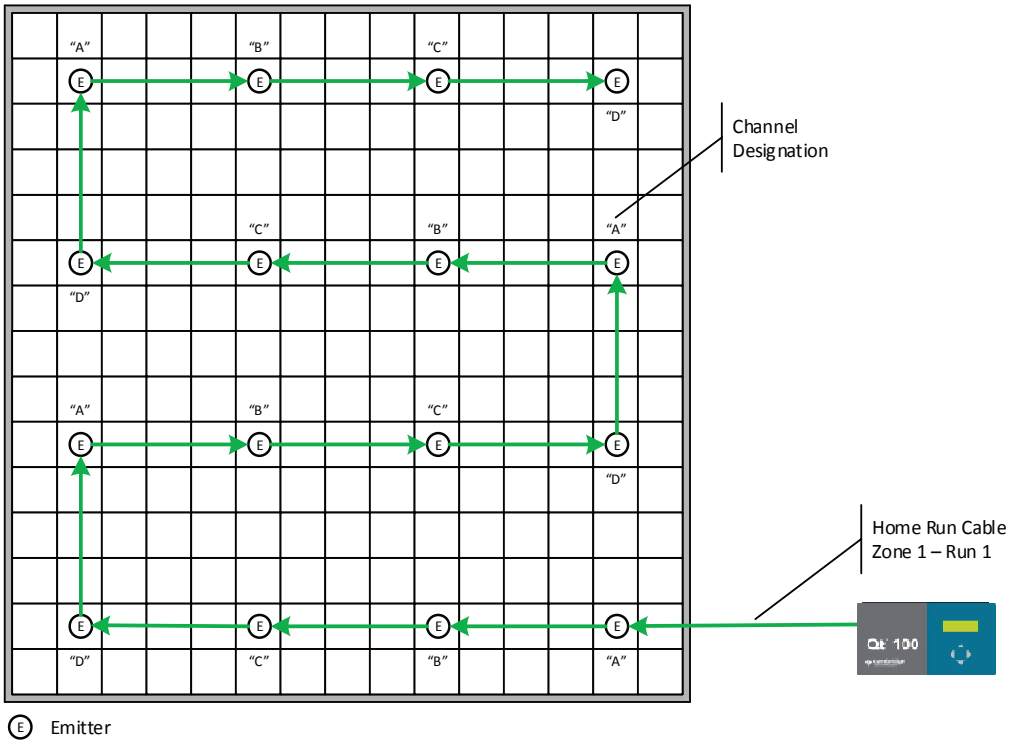
The channels of both the Qt Emitter and Qt Active Emitter devices are are automatically sequenced internally from the Input to Output jack on the rear of the emitter. Channel order is there by determined by the pathway taken when connecting each device base on channel order from the “Qt Control Processor’s” run designation. As stated earlier in this document each Zone has the following channel sequence:

- Zone “X” – Run 1 = Channels A, B, C, D, A, B, C, D, A, B etc.
- Zone “X” – Run 2 = Channels C, D, A, B, C, D, A, B, C, D etc.

To avoid the same soundmasking source being played from two adjacent speakers, it is important to understand that the cabling pathway will determine the channel sequence.

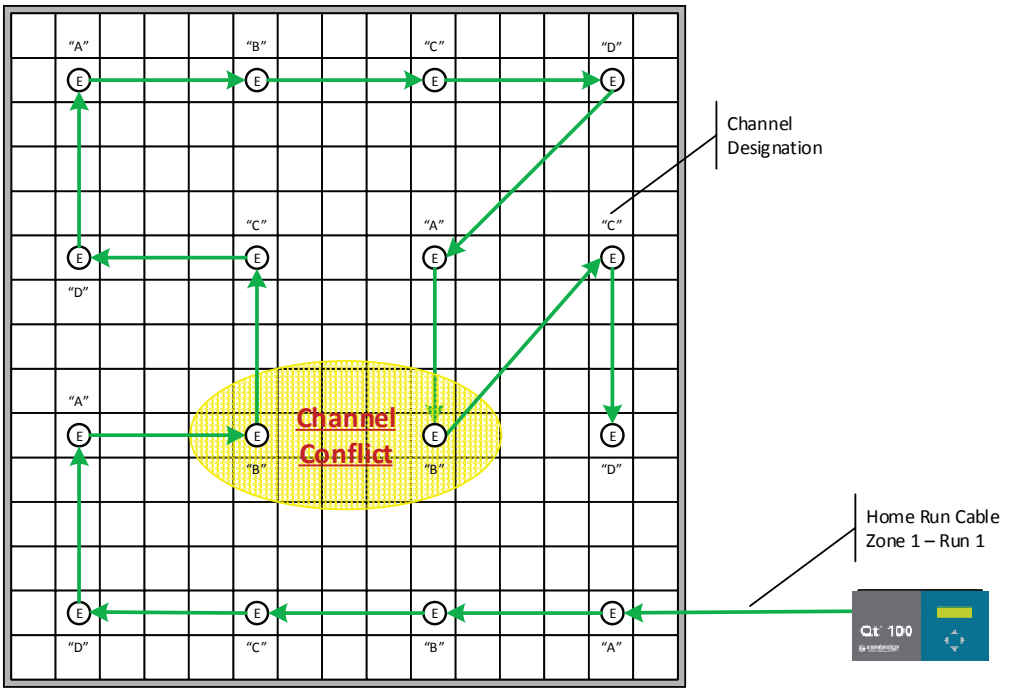
At no time should emitters be placed adjacent to one another if they reside on the same channel of the same zone. Doing so negatively impacts the soundmasking system’s performance by introducing comb filtering which is noticeable to occupants of the space and can lead to complaints.

It can be suggested that following a “serpentine” cabling path, as indicated in the examples below, can help alleviate channel conflicts in many cases. Due to the many variations in configurations however, both the wiring design and actual integration should always be confirmed.



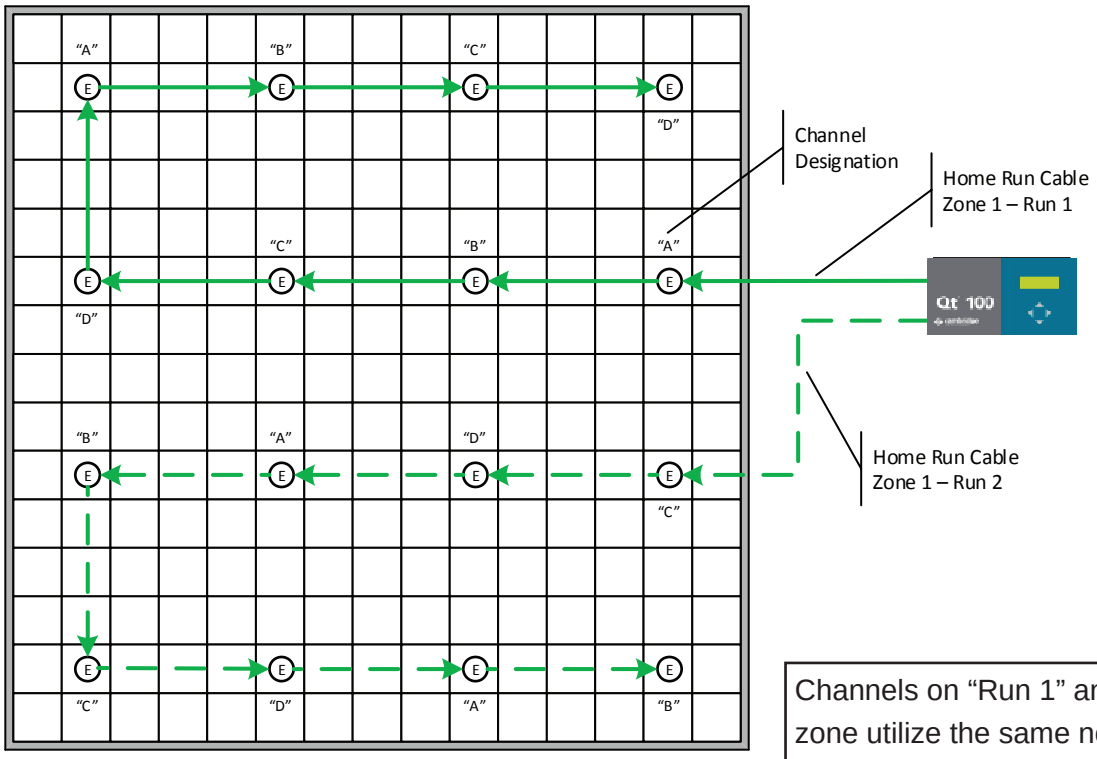

Qt Emitter Cabling Pathway 1 Zone - 1 Run
(Correct: No Adjacent Channels)

Channel sequence is determined by the “Qt Control Processor”, “Run #”, and the cabling pathway. Avoid channel conflicts by choosing a proper cabling pathway.



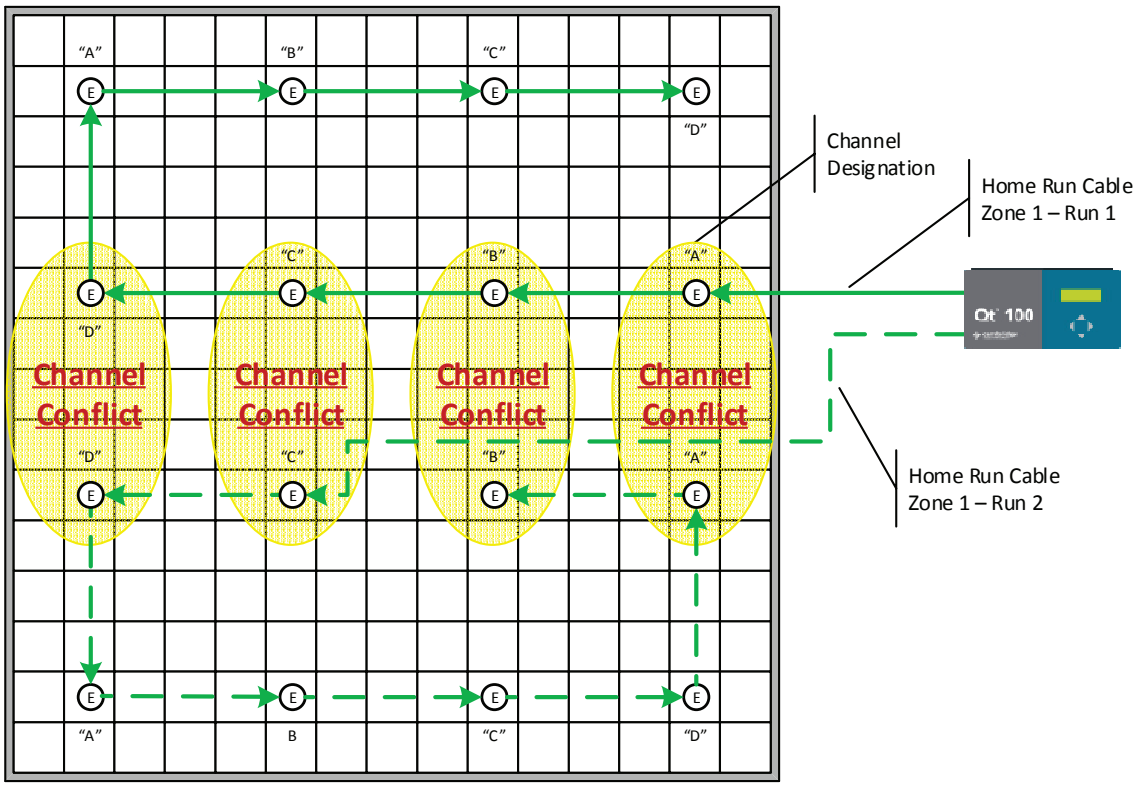

Qt Emitter Cabling Pathway 1 Zone - 1 Run
(Incorrect: With Adjacent Channels)

When multiple runs are deployed on the same zone, channel conflicts can also occur with two separate cabling pathways.



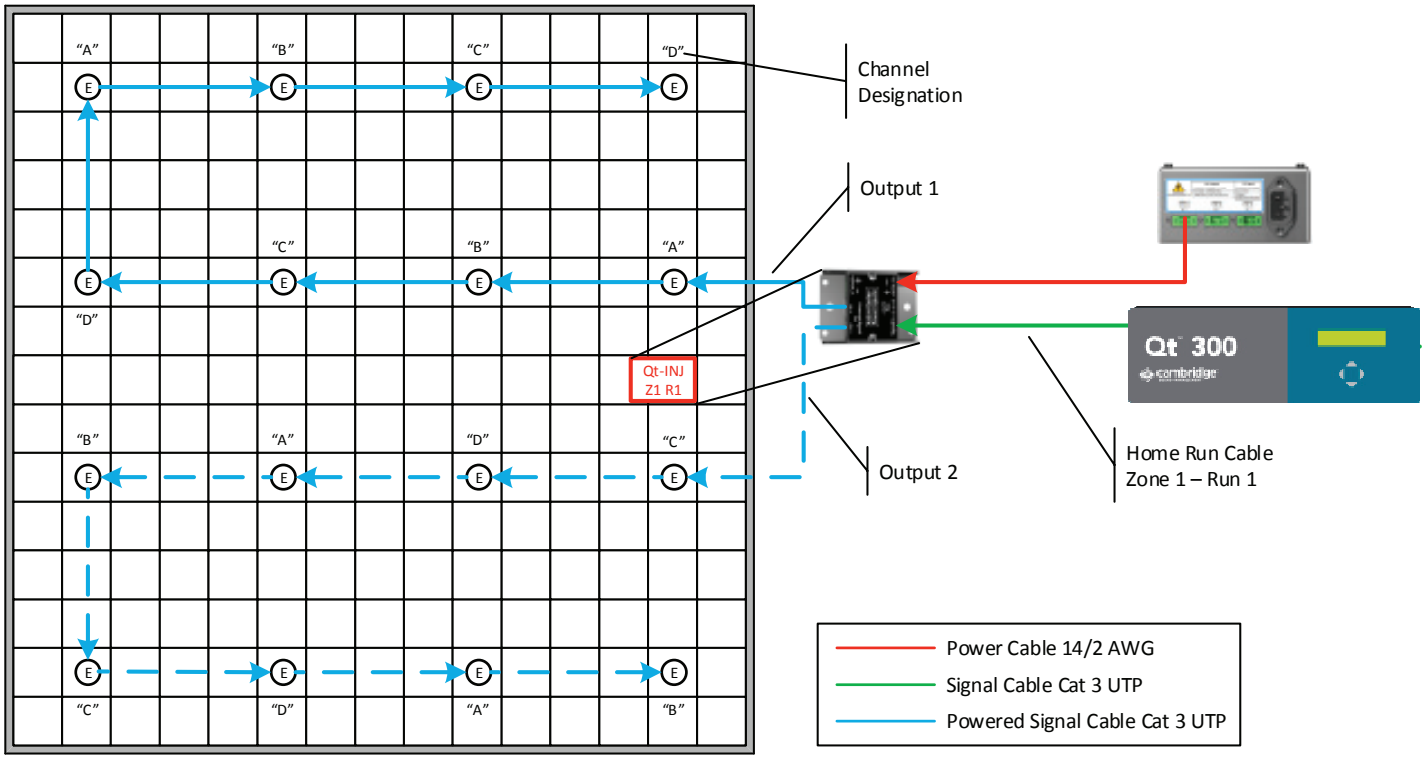

Qt Emitter Cabling Pathway 1 Zone - 2 Runs
(Correct: No Adjacent Channels)

Channels on "Run 1" and "Run 2" of the same zone utilize the same noise sources. "Run 1" and "Run 2" utilize a different channel order at the Qt Control Processors output jacks. Dependent on cabling pathway, this can lead to channel conflicts.



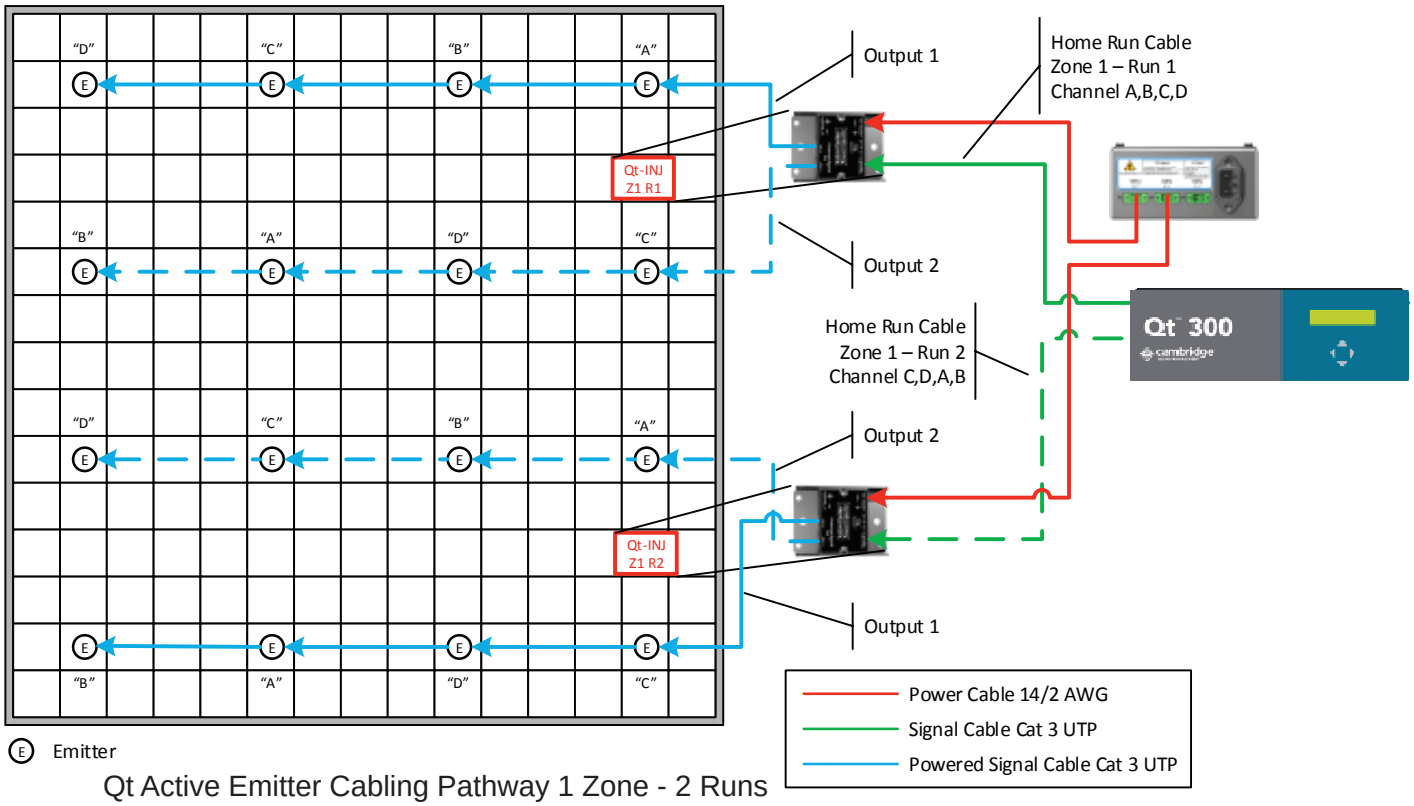

Qt Emitter Cabling Pathway 1 Zone - 2 Runs
(Incorrec: With Adjacent Channels)

Qt Active Emitter pathways include the addition of the Qt Active Emitter Power Supply and Qt Active Emitter Power Injector components. While either module can be mounted in a convenient location, the Injector is best mounted near the first emitter (or centered between two) in the cabling run to minimize home run cabling distances. Typical power supply location will be next to the Control Processor in most installations because the power supply is not rated for in plenum installation. The following diagrams indicate cabling pathways for both a single and dual run zone.




Qt Active Emitter Cabling Pathway 1 Zone - 1 Run
(Correct: No Adjacent Channels)

Injectors provide two separate "Outputs" with channel sequences offset by two channels. The input channel sequence determines the starting channel on "Output 1."




Qt Active Emitter Cabling Pathway 1 Zone - 2 Runs
(Correct: No Adjacent Channels)

## Troubleshooting Hints and Tips

The following items are common questions and issues our technical support team answers from the field.

1. Error Code on Qt Control Processor – In the event of an issue, the Qt Control Processor may show “Status: Error” on the Control Processor display. If this occurs, press the right arrow button on the front panel once to show the Error Code reported to help identify the type of issue as follows:

   Where a number other than “0” indicates an error:

   - 1 = Zone Shorted
   - 4 = Inoperable Emitter
   - 8 = Contact Manufacturer

   Error codes display the status data symbolically, with a digit to identify the Control Processor (if relevant), followed by a reserved digit (“_”), followed by a list of zones in right-to-left order. See the examples that follow:

### Error Code Examples

| | | |
|---|---|---|
| Code: | S_654321 = | Control Processor, Reserved, Zone6, Zone5, Zone4, Zone3, Zone2, Zone1 |
| Error: | 0_000000 = | Status OK. |
| Error: | 0_000001= | Short Sensed in Zone 1 |
| Error: | 0_110000= | Short Sensed in Zones 5 and 6 |
| Error: | 0_000400= | One or more Emitters not operating in Zone 3 |
| Error: | 8_000000= | Control Processor Error, Contact the Manufacturer |

Error codes may be cleared by pushing the “+” (up) arrow on the Control Processor when on the display menu shows the Error Code. However, If the cause of the issue has not been resolved, the error code may reappear at a later time.

Most Error Codes are often traced to a cabling issue. Common problems include:

- A shorted or improperly terminated category cable. – Check each cable on the zone with a continuity-type cable tester for “pin swaps” and good terminations. Home run cables are always the best place to begin since they are often field terminated with a higher failure rate than factory terminated cables.
- An unseated/poor RJ-45 jack connection. – Make sure each cable is firmly seated in the emitter jack and the jack is free of debris. (Tip: Leave protective tape on the rear of emitter until a connection is ready to be made to keep debris out of the emitter jacks.)
- Ensure that a return cabling path is not connected to another run or zone of the controller. – Follow the wiring path from first to last emitter in a run, to ensure only one end of the cable run is connected to the Control Processor’s output.

2. Inoperable Emitters – In cases where a single emitter is not operating, it is prudent to first swap that emitter with a known-good working unit until the true problem is identified. In cases where every fourth emitter in a cable run is inoperable, it is a sign of a dropped channel. (i.e., one of the four channels passed through each emitter and cable.)

If a single emitter is not working after swapping with a known-good unit, test and inspect the previous four emitter connections and cables. Each cable passes all four audio channels, meaning any of the previous four cable terminations could prevent the audio signal from reaching the inoperable emitter. Check each cable with a continuity-type cable tester.

If every fourth emitter is not working, go to the first emitter closest to the in-line Control Processor which is inoperable and check the four previous emitter connections and cables. If the first inoperable emitter is one of the first four in the cable run, the home run cable from the Control Processor to the first emitter is suspect. Check each cable with a continuity-type cable tester.

3. An emitter only operates when connected to the Output Jack. It is **never** acceptable to connect the Input signal to the Output jack of an emitter as the Input and Output jacks are not parallel connections (they allow in-order sequencing to the next channel). By swapping the Input and Output cables on the rear of the emitter, the previous emitter's channel is being reproduced, which leads to audible comb filtering interference in the masking system and can lead to overloading of a channel. As more emitters are added, this type of incorrect cable swap will result in the same problem reoccurring four emitters further down the cable run if not corrected.

   If an emitter operates only when connected to the Output jack, one of the four audio channels has been dropped prior to or at this connection point. Check the previous four emitter cables (and homerun cable if this occurs within one of the first four emitters) along with connections with a continuity cable tester to identify the issue.

   ! Never Swap the Input and Output connections on the rear of an emitter.

4. Perform a Control Processor Hard Reset - A reset of the control processor can be accomplished by removing and reapplying power in the following order:

   ! ALL SYSTEM MEMORY INCLUDING ALL SETTINGS WILL BE LOST.

   1. Disconnect Power for 15 Seconds.
   2. Hold all four front panel buttons while reapplying power. (Tip: Use a credit card or driver's license to hold all four buttons)
   3. Release Buttons after "Main CPU Booting" appears in the front panel display.

5. Emitters Turn On and Back Off, Repeating the Pattern – Is usually caused by either an excessive number of emitters on the same channel of a run, or a bad length of cable, or (rarely) even a bad emitter. Confirm that all emitters on the run are operating at the same audible level and that the total emitter/device count per run is less than 60 emitters/devices. Replace any inoperable emitters (or those with a low output level) and ensure that the Input and Output connections are connected properly on the rear of the emitter with the known-good cable. (Tip: A sound level meter held to the grille of the emitter will help identify an emitter with an unusually low output.)

   The root cause of this problem is usually a bad cable or very rarely an inoperable emitter which can lead an installer to swap input/output connections on the rear of the emitters. This swap therefore can overload one of the four channels because the run will now exceed the maximum device count. (15 emitters x 4 channels = 60 emitters per run).

For answers to questions not listed here, please feel free to utilize Cambridge Sound Management's host of resources as follows;

For best results it is preferable to make a tech support contact while the installing technician is on the project site becasuse most issues are more easily resolved through a step-by-step elimination process.

Technical Questions and Troubleshooting: techsupport@cambridgesound.com

Questions Regarding Design and Layout: designteam@cambridgesound.com

Many technical documents, product specifications, and product manuals may be found at the Cambridge

Sound Management Website http://www.cambridgesound.com

Contact Support at 1-800-219-8199

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