USITT/TSDCA SOUND DOCUMENTATION RECOMMENDED PRACTICE

Presented by USITT & TSDCA

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Disclaimer:
The drawings contained in this set of recommendations are adapted from real-world documents used in production. While details have been preserved in order to show clearly how professionals document their work, this set of recommendations does not imply endorsement of any product, company, or brand on the part of USITT, TSDCA, or the authors.

A Note on Format: please download this document as a PDF, in order see the correct formatting. If you read this as a web page, the formatting is likely to be incorrect.

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Introduction

The information which a sound designer or engineer must communicate to others has grown in complexity over the years, and today's sound professionals are often responsible for communicating information about system components, interconnections, physical positions, digital routing, network configuration, radio frequency configuration, and more.

This document presents a recommended practice for sound system documentation. It is not a comprehensive collection of graphic symbols, terms, and necessary paperwork, but is a flexible framework of document forms and practices for practical communication. The information which designers and engineers must communicate can be represented in many forms; this document will identify and describe several of the most common. Neatness, clarity, and legibility of these documents are top priorities.

1. System Block Diagram (also known as a "one-line", "schematic", etc.): a drawing or drawings of system components, illustrating how they are physically interconnected, and providing additional information as suitable to the project.
2. Plan and Elevation View drawings: while previously, the sound graphics recommendations instructed readers to refer to the USITT Scenic Recommendations for placement of sound objects, this set of Sound Recommendations includes Plan and Elevation Views, as there are several considerations unique to sound that bear addressing.
3. Hookups: spreadsheet documents explaining the system connections by piece of equipment (e.g. one part of a hookup will focus on all connections in and out of the FOH mixing console).
4. Routing Tables: explains the routing of signals within digital signal processing devices (e.g. digital mixing consoles, DSPs, etc.).
5. RF Tracking Sheets/Schedules: documenting any wireless microphones, wireless speakers, wireless in-ear monitors, and other such devices, showing radio frequency assignments, timing and positions of use, etc.
6. IP Schedules: tracking network addresses and details for any network-connected devices.
7. Rack Drawings and Custom Panel details: used to explain any custom racks and panels used in the system.
8. Com System Block Diagrams/Hookups: detailing the communications systems for a given production.
9. Power: detailing any custom power system configurations
10. Cable Labels: these may not be part of a designer's paperwork package, but are still critical paperwork tools for engineering team communications.
11. Schedules: lists of cables and other equipment subdivided by type, useful in assessing overall system needs.

Some sound system designs will be very simple, and as such may not necessitate the use of all of these documents. Other sound systems will be very complex, and may necessitate not only all of the above documents, but others that remain unaddressed in this document (e.g. custom mounting hardware details for loudspeakers mounted in a scenic item). It is expected that at minimum, a sound system's documentation will include either or both of a System Block Diagram and Hookup, Plan and Elevation Views of all loudspeaker and other major physical item positions, and intended Routing tables for any digital signal paths. Shop orders (lists of equipment to be rented from a production company, or "shop"), pick lists (lists of equipment to be pulled from the stock of a production company for use in a production), and other such installation documents are outside of the scope of these recommendations.

Document Package Setup

All of the above-mentioned documents make up what is known as a document package (or "drawing set"). Before creating specific documents to go in a package, it is important to set up said package, such that customs established in one part of the package are adhered to throughout, pages are numbered and labeled consistently, etc.

Cover Sheet

The first page of any document package is typically a cover sheet (aka "title page", "title sheet", etc.). This page can simply name the project and design team, as well as containing the title block (see below) template for the rest of the package. It may also serve to list general notes applicable to the entire package, host a legend (see below) of symbols used in the drawing package, and identify any other conventions used throughout the package that may be unique to this document set.

Title Blocks & Headers

A title block or header is an identifier that will appear on every page of a document package. Title blocks are found on any drafted plate/sheet, and sometimes on spreadsheets as well, though sometimes the full title block is replaced on spreadsheets and other text documents with a simplified header, which still includes most of the pertinent information listed below. Title blocks are sometimes provided by the producing organization, with the intent that documents generated by all departments are unified by the title block. Title blocks, at bare minimum, contain:

- Name of production
- Name of producing organization
- Name(s) of designer(s)

- Name of draftsperson (if different from the designer)
- Title of each document plate or sheet which should reflect the discipline (i.e. "sound") and should be sequentially numbered. Some organizations dictate naming conventions for projects.
- Current date of drawing, and/or revision number or identifier (some projects or organizations track revisions by date, some by revision number, e.g. “Drawing X Version 2”)
- Disclaimers: depending on the current phase of the project, and who generated it, it is very common for documents to include disclaimers such as “not for construction”, “design intent only”, “for bidding only”, “issued for build”, etc. These are important distinctions about who is liable for the work at hand, and for what phase of the project the documents are intended.
- Drawing scale (if the document shows real facilities, and not a block diagram or other information)
- Contact information for relevant parties

Title blocks are most commonly found either as blocks of information occupying the bottom right corner of a document, the entire right side of a document, or the entire bottom edge of a document.

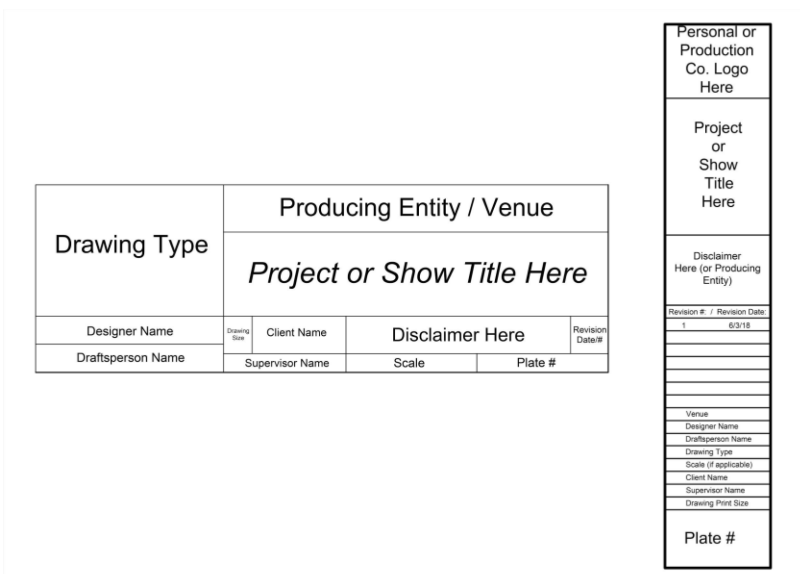


Figure I.1: Example title blocks

Legend (aka “Key”)

A legend shows all symbols used in a document set, and identifies them. Symbols used in block diagrams should be standardized, as described below in Section 1, and any variations from the below described should be identified in the legend. Any symbols used in plan and elevation view drawings should ideally be to the exact scale and dimensions of the actual objects to be used (many such symbols can be downloaded directly from manufacturer websites). If no manufacturer-provided symbols can be found for the object in question, create a symbol that is as close to real dimensions as possible (and by no means smaller) than the actual object. All symbols used in plan and elevation view drawings should be identified in the legend. Additionally, all note conventions used in the document package should be shown in the legend.

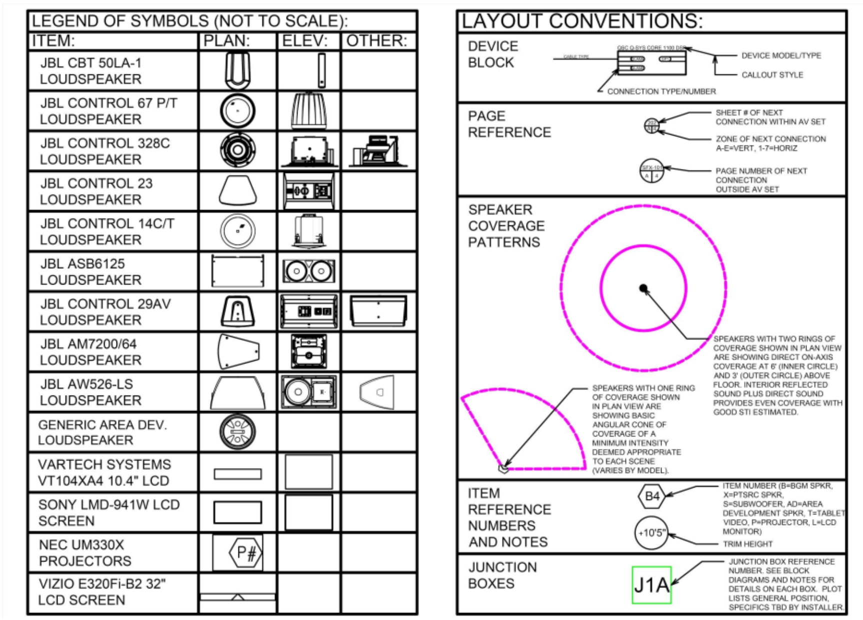


Figure I.2: Example legends

Plates/Sheets

Plates/Sheets are individual pages in a document set that lay out different parts of the entire system package. A sheet index (or table of contents) is common either on the cover sheet or near the front of a drawing set. Common plate types include: System Block Diagram, Plan View, Section View, Elevation View, Rack Elevations, Electrical System Block Diagram, FOH layout, etc. Plate name and numbers should be listed in the Title Block/Key on every page. This allows someone viewing the drawing(s) to quickly find information they need.

Callouts

A callout is a short string of text connected with a line and arrow used to indicate a note.

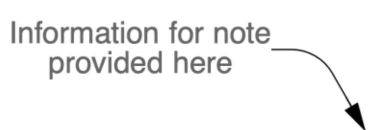


Figure I.3: Example callout

Connector Naming

Efforts have been made lately in the professional theatrical sound community to replace gendered and other archaic terminology. To that purpose:

- The end of a cable that has pins which fit into receptacles on the opposite connector will be referred to as the ***PLUG*** or ***PIN*** end. This is the signal-bearing output side of XLR cables in typical usage, both ends of a typical guitar patch cable, both ends of a typical network cable, etc.
- The end of a cable with holes which pins on the opposite connector will fit into will be referred to as the ***SOCKET*** end. This is the signal-receiving input side of XLR cables in typical usage, a typical wall-mounted electrical outlet, etc.
- Speakon and PowerCon share physical forms that are somewhat less conventional. The connectors typically mounted on cable ends will be referred to as ***PLUGS***. The connectors typically mounted on panels or on loudspeaker enclosures will be referred to as ***SOCKETS***. PowerCon connectors may additionally be referred to by their color when applicable.

Figure I.4: An XLR-3 socket is pictured on the left. An XLR-3 plug is pictured on the right

Multicable is used here to mean any cable which carries multiple signals that can be separated from each other physically. Other names for this include “mult”, “multicore cable”, or “snake.”

Note that XLRP and XLRS are abbreviations for XLR Plug and XLR Socket, respectively.

Figure I.5: 16-channel multicable

This picture shows a sixteen-channel (also called sixteen pair, or simply 16Pr) multicable with a permanently attached stage box on the left and a permanently attached fanout on the right. The stage box has twelve XLR-3 sockets and four XLR-3 plugs; the fanout has twelve XLR-3 plugs and four XLR-3 sockets.

A single CAT-6 cable carrying 64 channels of audio on a Dante network is conceptually filling the role of multicable, but since the signals cannot be physically separated (software is required to separate the signals) the cable is not a multicable.

A Note on the Use of Color in Document Packages

Color-coding can be used to enhance readability of a technical drawing or document (e.g. by drawing analog cables in one color, and network cables in another). However, color should never be the sole means of communicating a piece of information, as readers with color vision deficiency may have a difficult time understanding the intent; additionally many drawings end up printed in black and white, and if color is the only site of a piece of information, it will be lost in the print.

A Note on Manufacturer-Specific Terminology

Whenever documentation of a system reaches the level of detail where individual models of equipment are being specified (as opposed to early documents, which may refer to generic device types), refer to the manufacturers' documentation for details and specific naming conventions. It is the goal of technical documentation to present the clearest possible picture of the system for the crew installing and using it, so it is important to match naming conventions to the manufacturers' actual nomenclature. For example, if an Aux Send in a mixing console is routed to a physical output, note whether that output is called a "Mix Out", an "Omni Out", or some other name, and use the appropriate name used by that particular console system in the documentation.

A Note on Safety

When preparing sound system documentation, it is sometimes necessary to document rigging, electrical power systems, or other features of a system that require special qualifications and/or training. A document set should note that drawings are representing design intent only, unless the documents have been prepared by someone with those qualifications and/or training.

1. System Block Diagrams

1.1) SBD Overview

System block diagrams, hereafter abbreviated SBD, are graphic representations intended to communicate the components of a system and how those components are interconnected as a whole. In the simplest terms, an SBD uses blocks and symbols to represent device components, and lines to represent signal cables that interconnect those components. It is representational and not to scale. It generally reads from left to right, with sources/inputs (e.g. computers and microphones) on the left, and outputs/destinations (e.g. loudspeakers) on the right (though in the case of devices, such as network switches, that communicate bi-directionally, this is less relevant).

As with other paperwork, text must be of a legible size when printed (minimum text height of ⅛” at full scale is recommended). Larger text for items like device block headers can be useful.

Here is an example of an SBD from a distant view which is intended to give the reader a sense of the drawing as a whole.

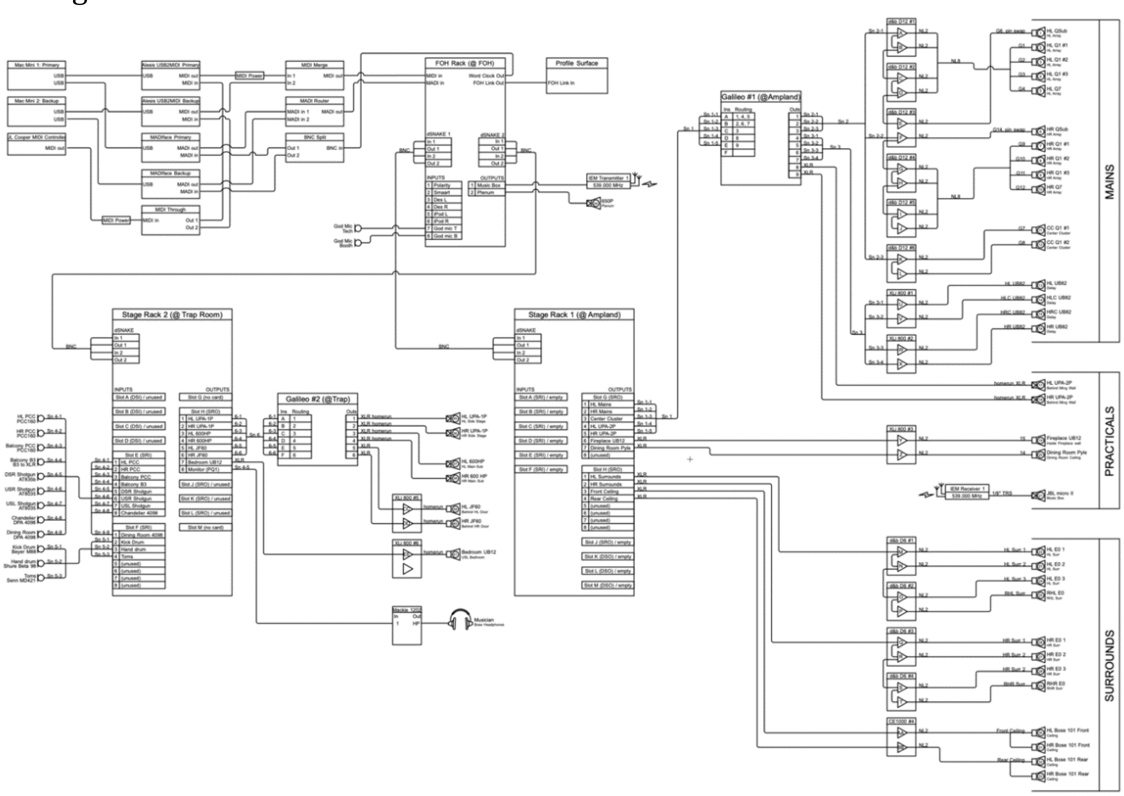


Figure 1.1.1: A zoomed out view of an entire sound system represented as System Block Diagram (SBD).

An SBD may serve two purposes. First, it may be used as a tool to aid the system engineer in constructing and understanding the complex layout of a sound system during the planning stages. Second, and most important, it communicates how the system is physically interconnected.

It is suggested that the design and layout of the document be focused to this end. Readability is key, and which information is included and which is excluded should prioritize information needed to understand and physically install the system. Internal signal routing may be represented in a separate document (see Section 4: Routing).

System block diagrams may show all relevant connections in a single drawing, or they may be broken out into separate plates for distinct types of connection (e.g. all network connections may be shown separate from analog audio connections, and complex power or antenna distribution setups may necessitate their own plates for clarity).

1.2) Device Blocks – Overview

A device block is a graphic that represents an individual component in a system. The suggested format for a device block is that it should be a simple rectangle with pertinent information included inside. Information/parameters included in a device block should be:

- Device make & model information
- General equipment type/usage information
- Unique number or letter scheme to help identify and differentiate units of the same type/usage (e.g. multiple power amplifiers in a system)
- Input connection information (left side of block) and output connection information (right side of block); bi-directional control or communications connections may be located on either side or the bottom of the device block; whichever best serves clarity (see examples below)
    - Input/output (I/O) numbers or connector labels as seen on the physical device
    - I/O headers that further specify I/O group information
    - Source/destination information for channels (optional)
    - Symbols that denote connector type (optional)

Make & Model

Type/Usage (#)

Input Group Info		Output Group Info	
1	Source 1	Destination 1	1
2	Source 2	Destination 2	2
3			3
4			4
5			5
6			6
7			7
8			8
9			9
10			10
11			11
12			12
13			13
14			14
15			15
16			16

Figure 1.2.1: Example device block

Below is a specific example, with reference images showing the front and back of a device, followed by its device block representation.

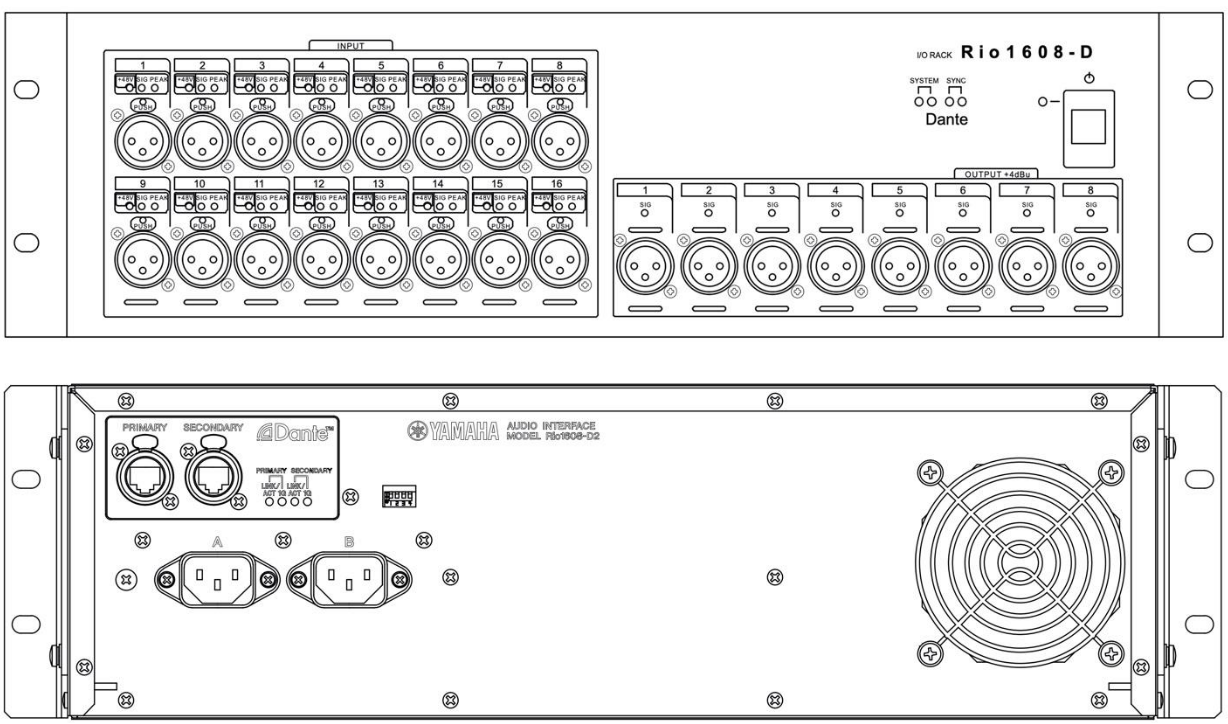


Figure 1.2.2: Front and back of physical stage box, device block based on this unit shown in Figure 1.2.3

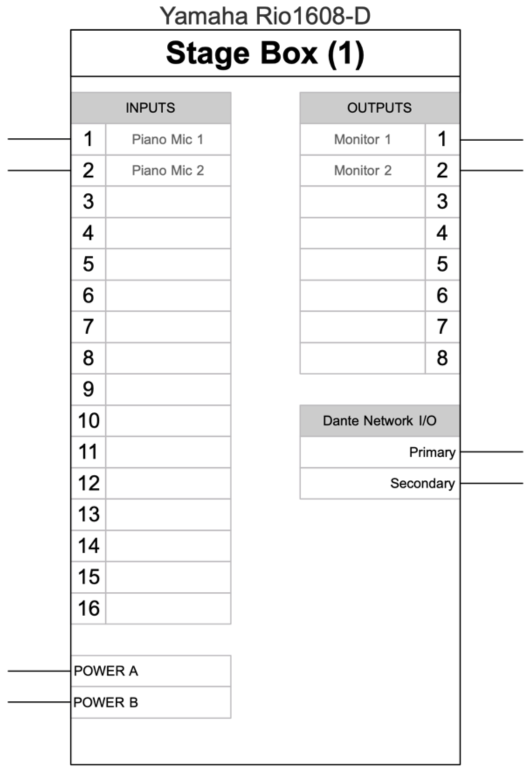


Figure 1.2.3: Device block representation of the above device

Note that in the above device block (figure 1.2.3), the (1) next to the device description indicates that there will be more than one stage box in this system. Another will have "Stage Box (2)" listed in the device block header. Note that the device block in the above figure includes power connections. Including power in SBDs is optional.

A few hypothetical mic sources and line output destinations have been listed in the device block (inputs from piano mic 1 and 2, and outputs to stage monitor 1 and 2). As stated before, this additional source/destination information per channel is optional.

1.3) Device Blocks – Unused Inputs/Outputs

In the device block shown in figure 1.2.3, all available inputs and outputs are represented, but this is not always necessary. Sometimes it is preferable to exclude unused inputs and outputs in device blocks in order to save space and avoid buildup of extraneous information.

Figure 1.3.1 shows a device block with inputs, outputs, and entire card slots excluded. Information is provided to the reader in an abbreviated fashion to clarify that those unused connections do exist on the device. Including this information can help ensure that a member of the load in crew doesn't accidentally connect something to available ports that should remain unused.

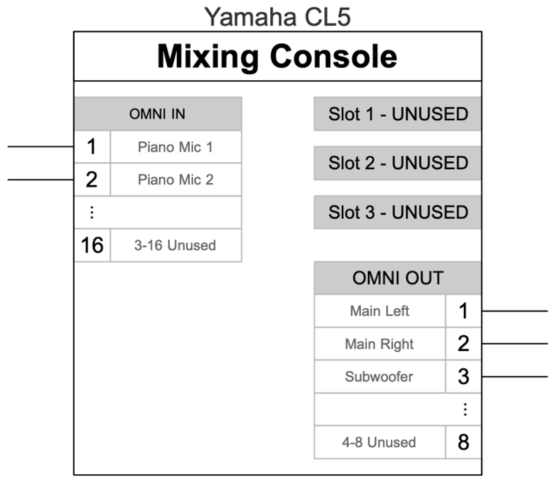


Figure 1.3.1: Device Block representation of Yamaha CL5 with many unused connections condensed

1.4) Device Block – Connections & Cable Paths

Device blocks are connected with lines which represent cable paths. Below is an example of two connected devices in a system. Note that rounded corners are often used to help visually distinguish cable paths from the sharp corners of device blocks.

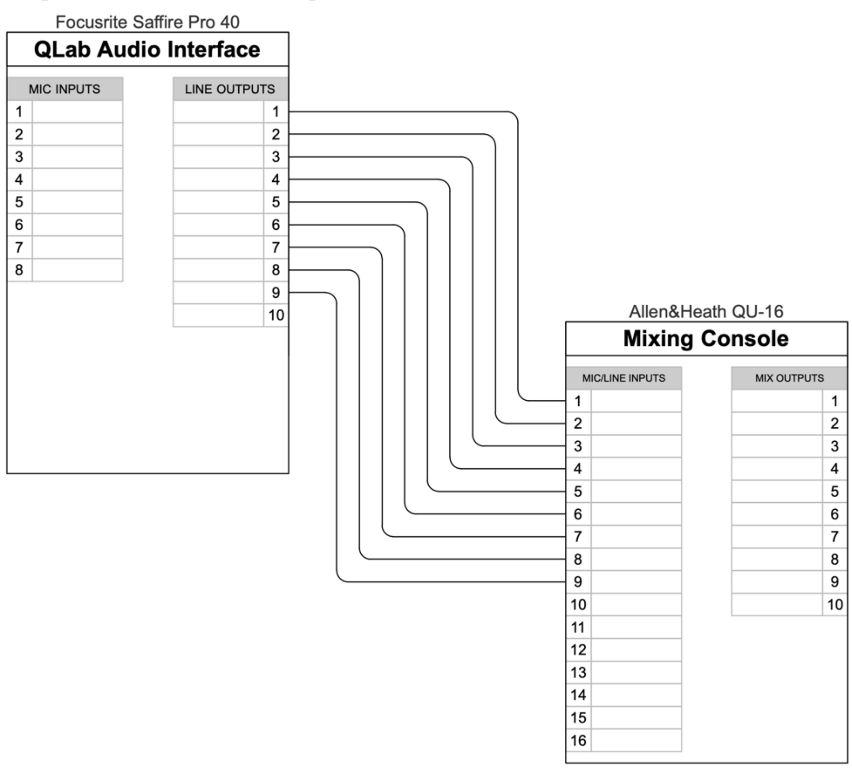


Figure 1.4.1: Example of cable paths between two connected device blocks

1.5) Cable Path Jumps and Splits

Cable paths in SBDs will very often need to cross one another. Line jumps are an optional style for keeping the separation of signal paths clear. Figure 1.5.1 shows two options for how to represent this graphically.

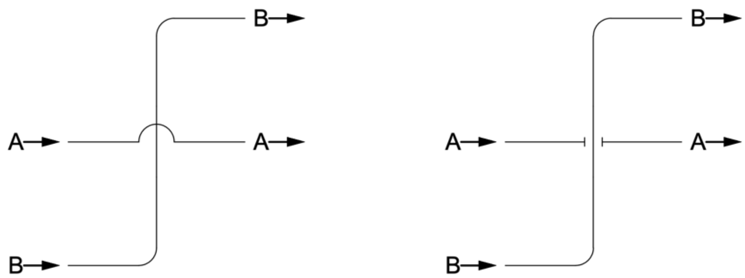


Figure 1.5.1: Two examples of how cable line jumps can be drawn

When a signal is duplicated via a splitter, a small dot may be used to indicate this. Additionally, a callout may be included to specify how the split is being accomplished.

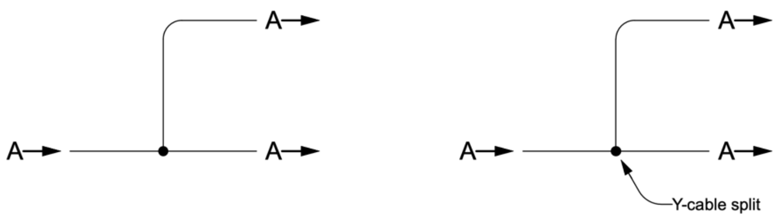


Figure 1.5.2: Example of how signal split can be drawn

1.6) Cable Path Jumps Across Sheets

A “Fly-off” can be used to indicate cable path jumps that span greater distances across the document or from one sheet to another. A unique number/letter scheme should be used and a note included indicating where to find the other side of the fly-off.

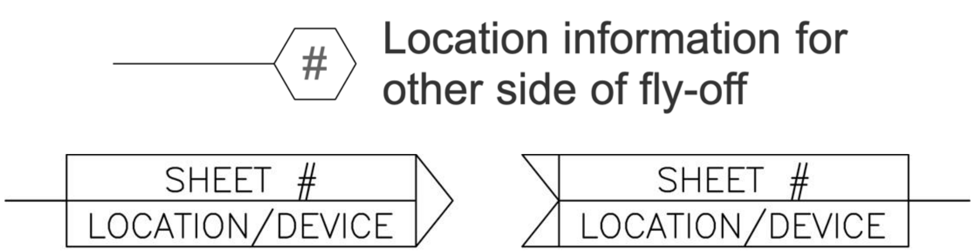


Figure 1.6.1: Example of fly-off templates: in-page (above), inter-page (below)

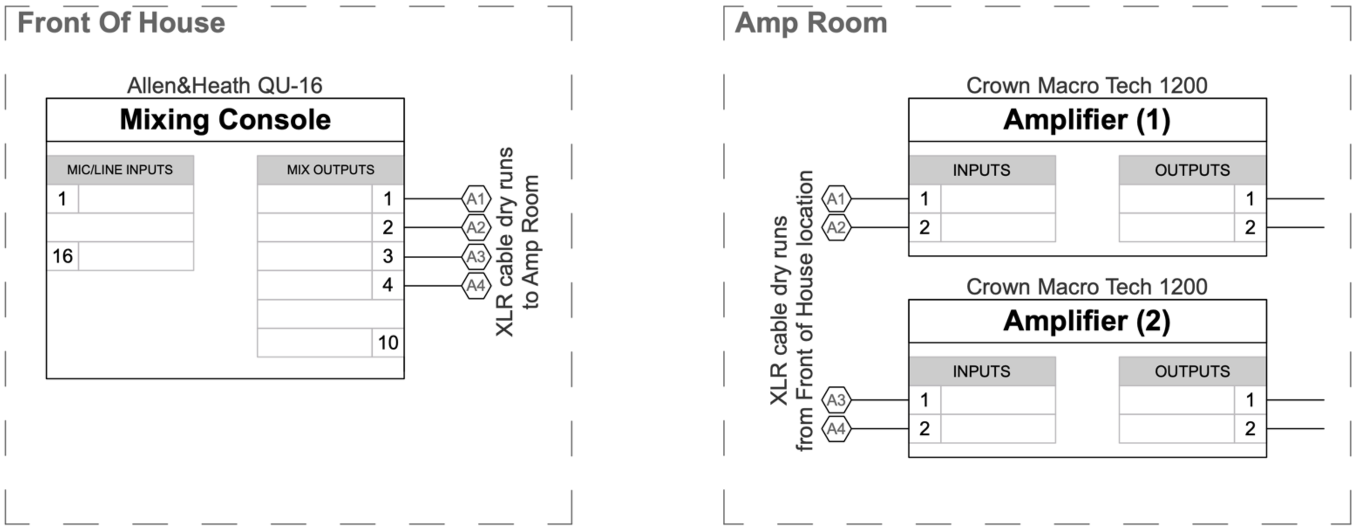


Figure 1.6.2: Example of in-page fly-offs

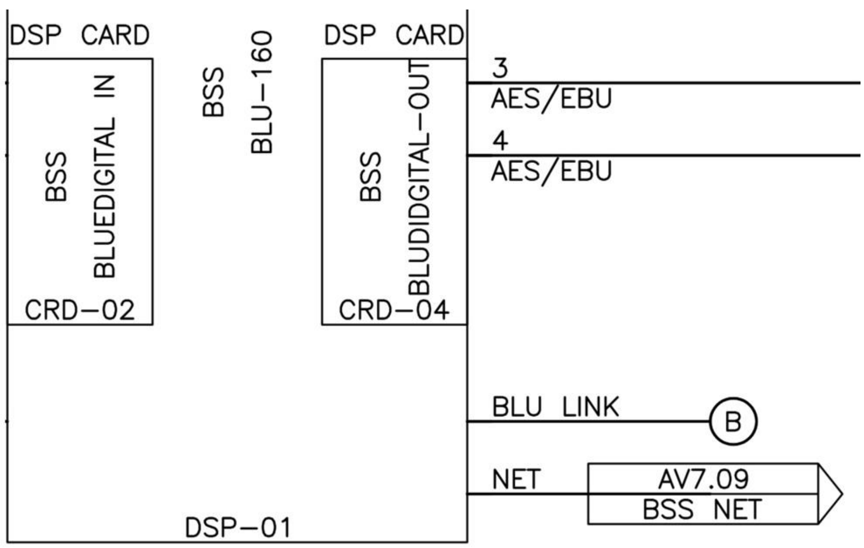


Figure 1.6.3: Example of inter-page fly-offs, with in-page fly-offs

1.7) Information Provided on Cable Paths

Written text placed on or near cable paths is often used to provide additional information. Information provided in this form may include:

- Cable type
- Cable connector type
- Cable length
- Cable run/path details
- Clarification about physical patching

- Source/destination information
- Identifying numbers for lines in a multicore cable
- Usage/description of signal

1.8) Condensing Cable Paths

Multiple signal paths can be condensed into a single line for a number of reasons, including:

- Representation of multiple individual cables running the same physical path
- Representation of a prepared bundle of cables

When condensing cable paths for these reasons, a callout should be added to note that this technique is being used to simplify the drawing, and to clarify the physical layout and patching. See example in Figure 1.8.1.

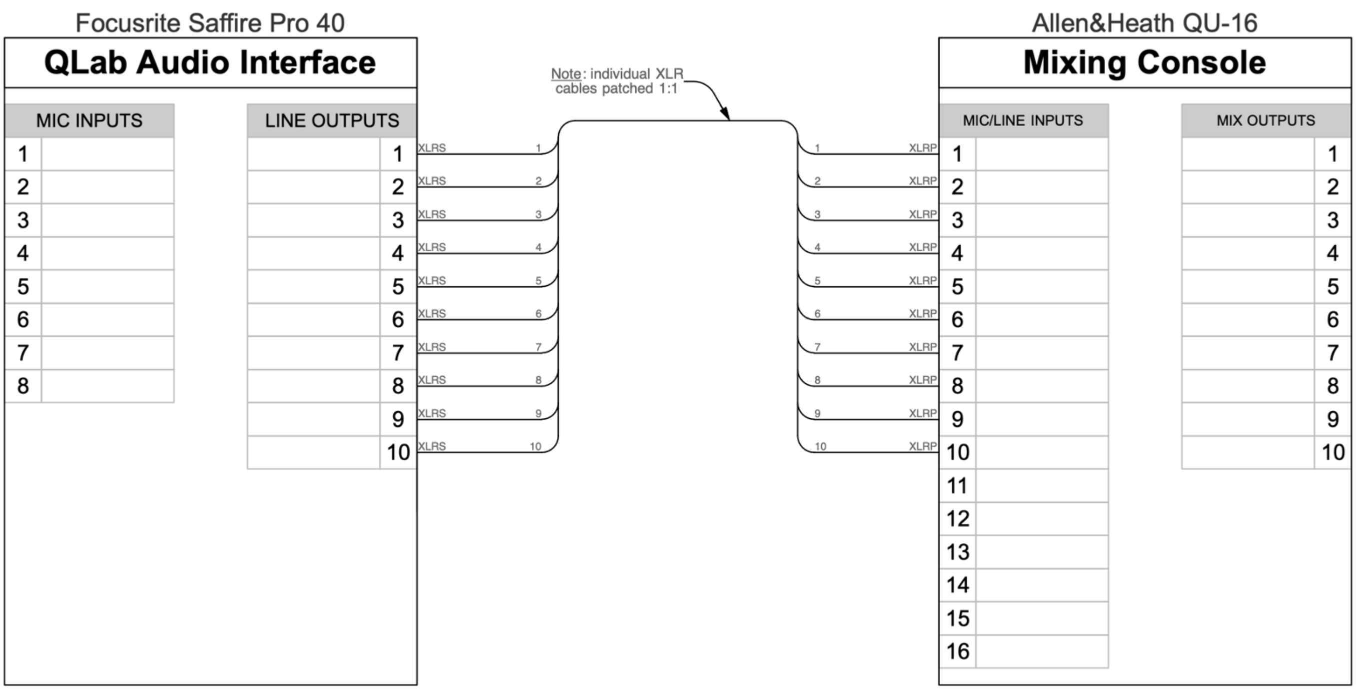


Figure 1.8.1: Example of multiple individual cables being bundled and running the same physical path, each of which patched in a 1-to-1, input-to-output, sequence

1.9) Condensing Connection Sequences in Device Blocks

In addition to condensing cable paths as outlined above, physical device connections may also be condensed to save space. This technique is especially useful when devices have a large number of connections in use. Unless otherwise specified, a 1-to-1, input-to-output sequence will be assumed between devices.

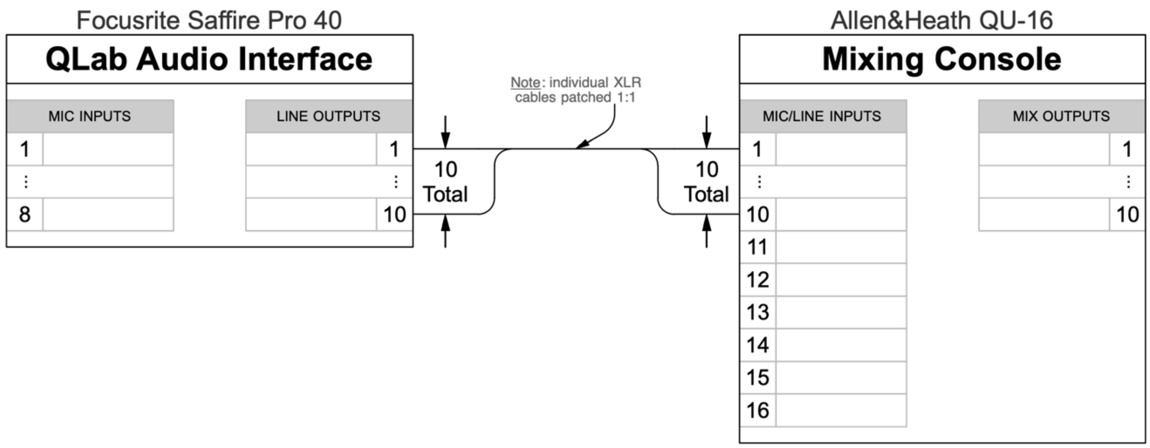


Figure 1.9.1: Example of condensed input and output connections in device blocks

1.10) Multicore Cable

In addition to condensing multiple signal paths into a single line, representations of multicore cable can also include additional information such as:

- Each line numbered
- Information about multicore cable type
- Source/destination information
- Cable connector type

A multicore run can end at a fanout of cables, a stage box, or a rack/panel mount. These can be represented in a variety of ways, but as always, clarity is of paramount importance.

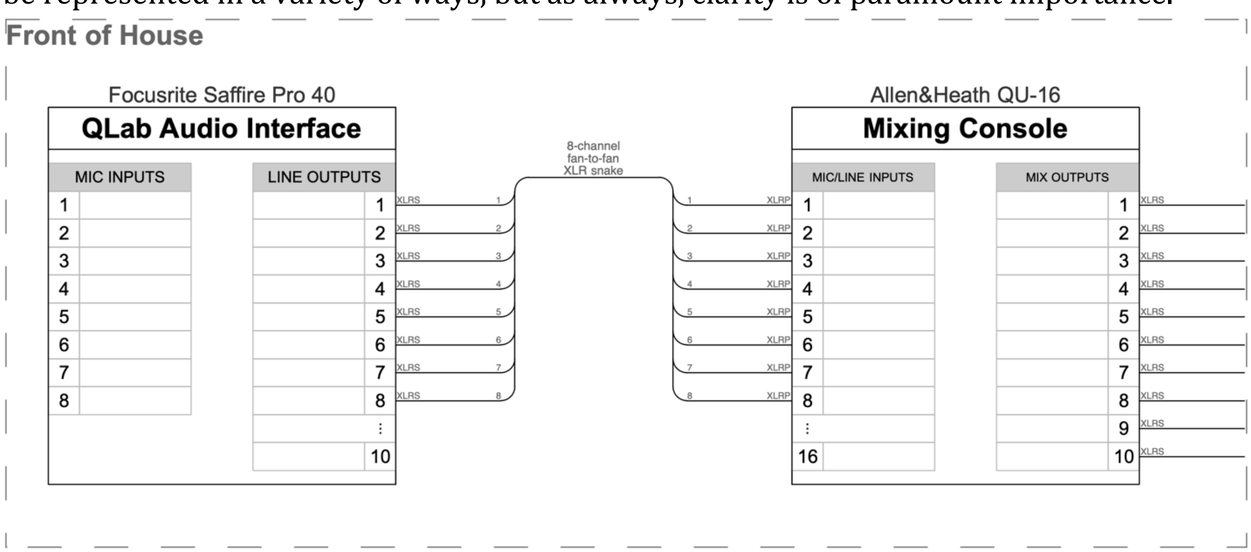


Figure 1.10.1: Example of 8-channel, fan-to fan multicore cable

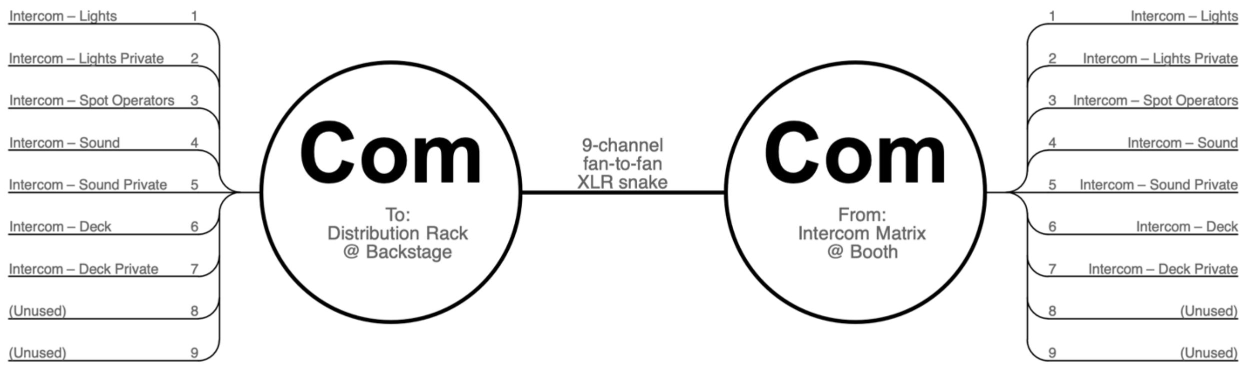


Figure 1.10.2: Another way to represent a fan-to-fan multicore cable

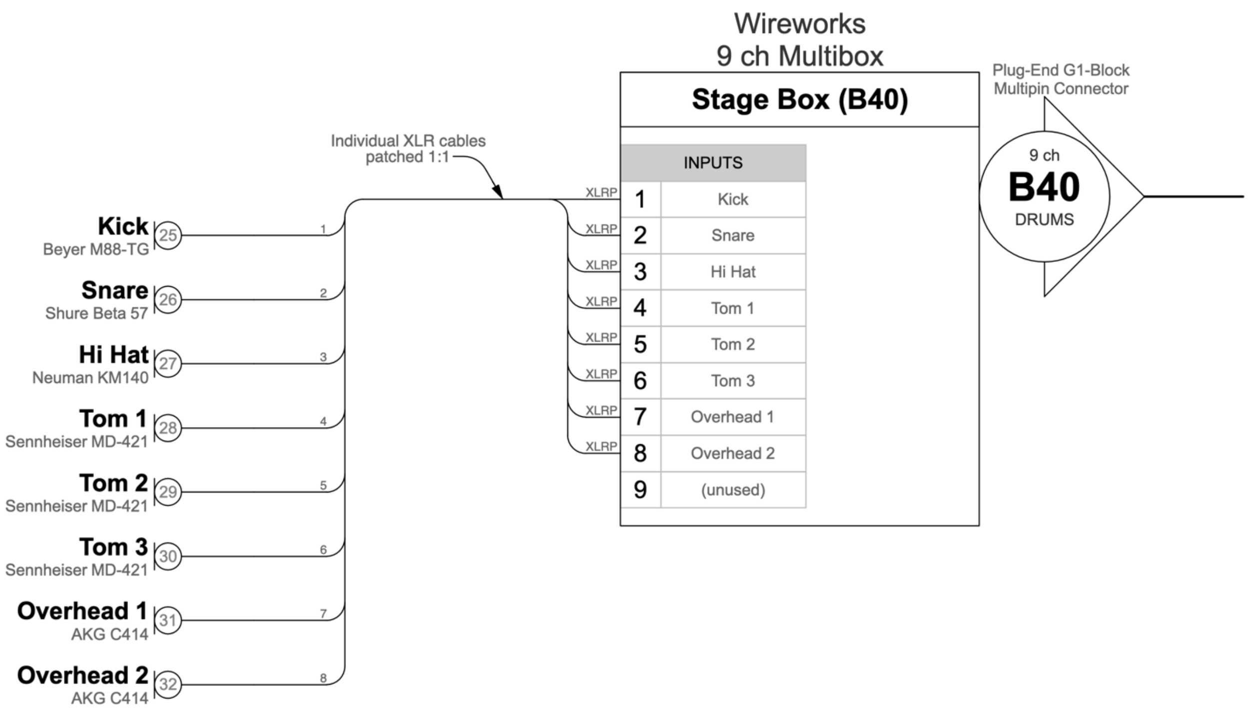


Figure 1.10.3: Example of 9-channel multicore cable with stage box and multipin connector

The diagram in Figure 1.10.3 makes use of a conventional architectural symbol to represent the multipin connector. Information within that symbol includes number of lines, a unique number/letter scheme, and usage/description of signal.

1.11) Amplifiers

Amplifiers can be represented in an SBD as a standard device block as shown in figure 1.11.1 below. Alternatively, an optional right-facing equilateral triangle symbol may also be used to help quickly identify an amplifier channel.

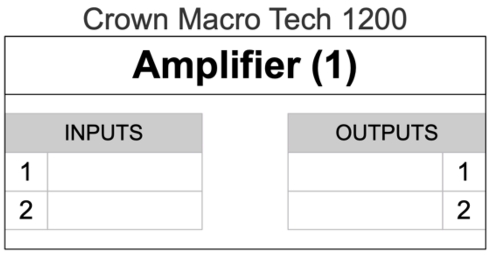


Figure 1.11.1: Example of amplifier in standard device block form

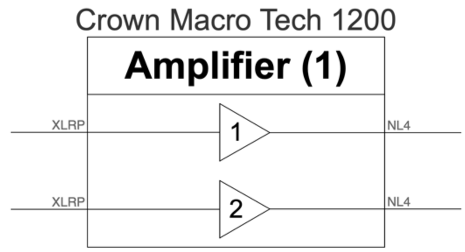


Figure 1.11.2: Example of amplifier device block with optional triangle symbols for channels

1.12) Loudspeaker and Microphone Symbols

While device blocks may be used to represent microphones and loudspeakers, it is also common to find these represented more pictorially, though the use of these symbols is optional. Despite how they are represented, important information should always be listed, including:

- Device make & model information
- General usage information
- Unique number or letter scheme

In figure 1.12.1, note that loudspeaker symbols should include a small triangle to indicate that they are active (self-powered).

Figure 1.12.1: Examples of microphone and loudspeaker symbols

1.13) General Group Information

When multiple components of a system have some shared group information, brackets can be used to indicate this.

Figure 1.13.1 shows an oval drawn around a group of cables that share a function or callout.

Figure 1.13.2 shows loudspeakers grouped by system function into groups labeled “MAINS” and “PRACTICALS”.

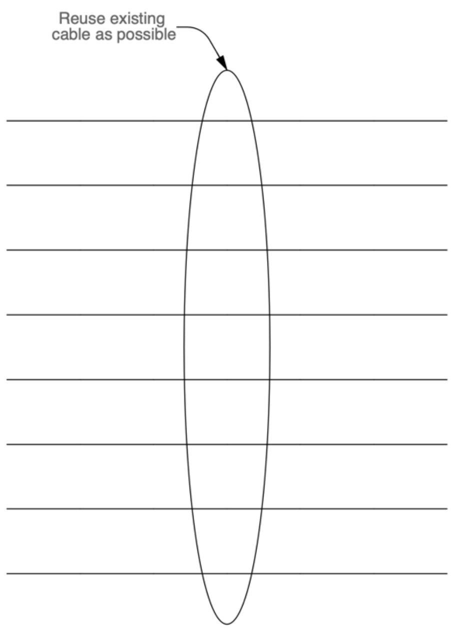


Figure 1.13.1: Example of oval around cable paths for callout.

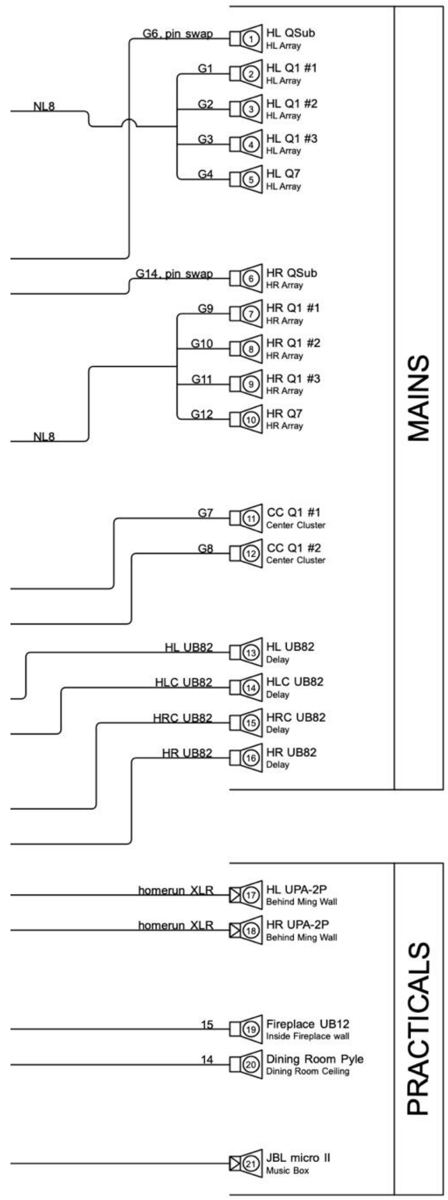


Figure 1.13.2: Example of loudspeaker group information

1.14) Specifying Location

The installed location of a device or group of devices can be specified using dashed lines to enclose segments of the system diagram. Locations commonly specified include designated racks or spaces within a venue (e.g. amp room, booth, trap room, front of house, etc.). Figure 1.14.1 shows an example of four amplifiers inside of a rack, which has been designated as “Amp Rack 1.”

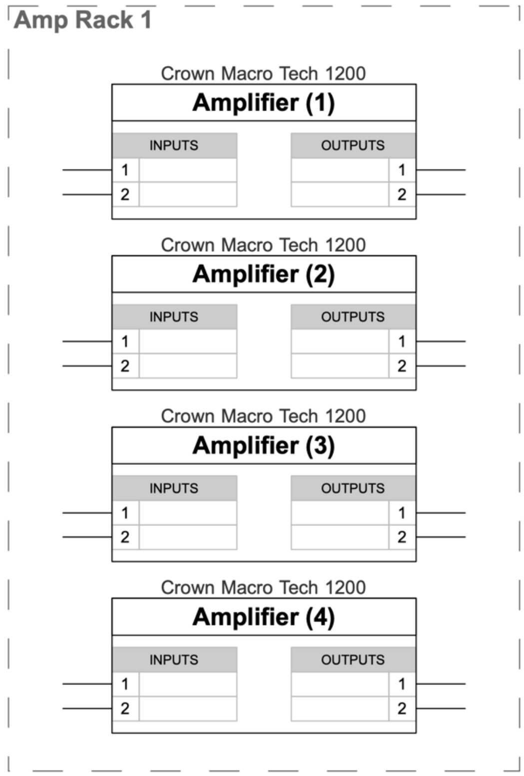


Figure 1.14.1: Example of dashed lines enclosing a segment of a system to indicate location in a rack

Location information can also be included in device blocks or next to microphone and loudspeaker symbols. Figure 1.14.2 shows a device block located at front-of-house.

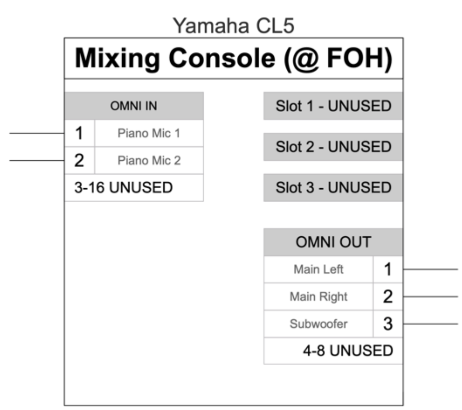


Figure 1.14.2: Example of location information included in device description

1.15) Break Lines to Indicate Multiple Instances of a Device

Sometimes, to better serve layout organization and readability, a single device may be drawn in more than one place. For an example, consider a stage box which has microphone sources connected to its inputs, and monitor loudspeaker destinations connected to its outputs.

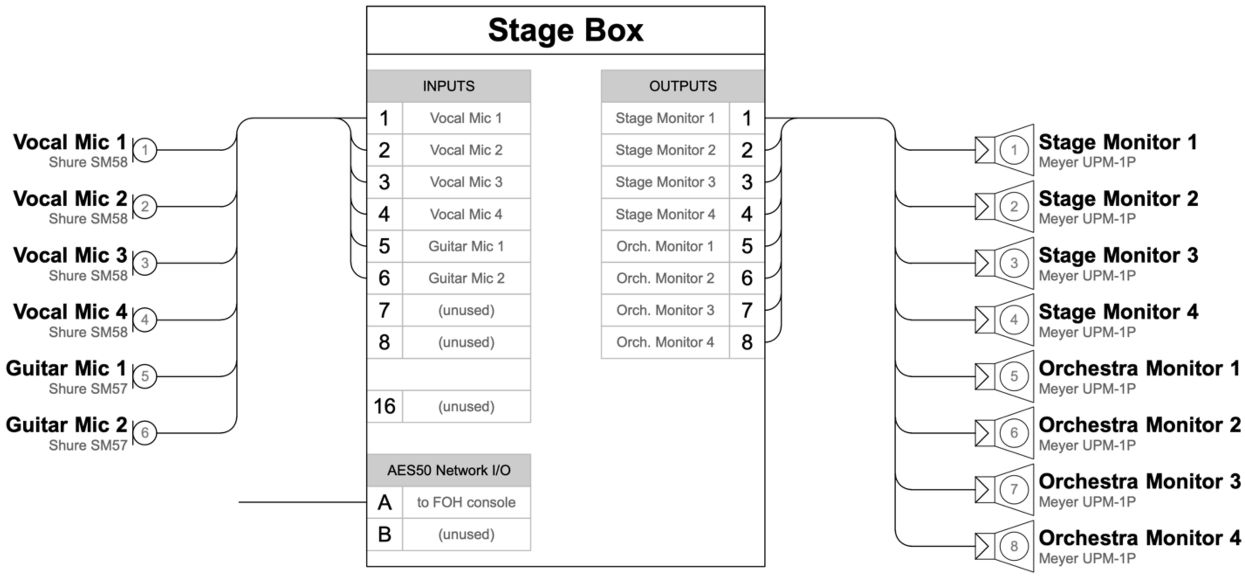


Figure 1.15.1: Example of stage box device block with microphone symbols on the left and loudspeaker symbols on the right

Because microphones and other input sources are typically shown on the left of a drawing, and loudspeakers on the right side, it may be desirable to represent this stage box in two places–one to the left of the mixing console, and one to the right–to improve clarity and reduce unnecessary cable path clutter.

A break line or curved line on one side of the device blocks is used to indicate that the device is represented in more than one place in an SBD. A note can also be included that states where the other representation(s) are located. Below are three examples of how this can be drawn.

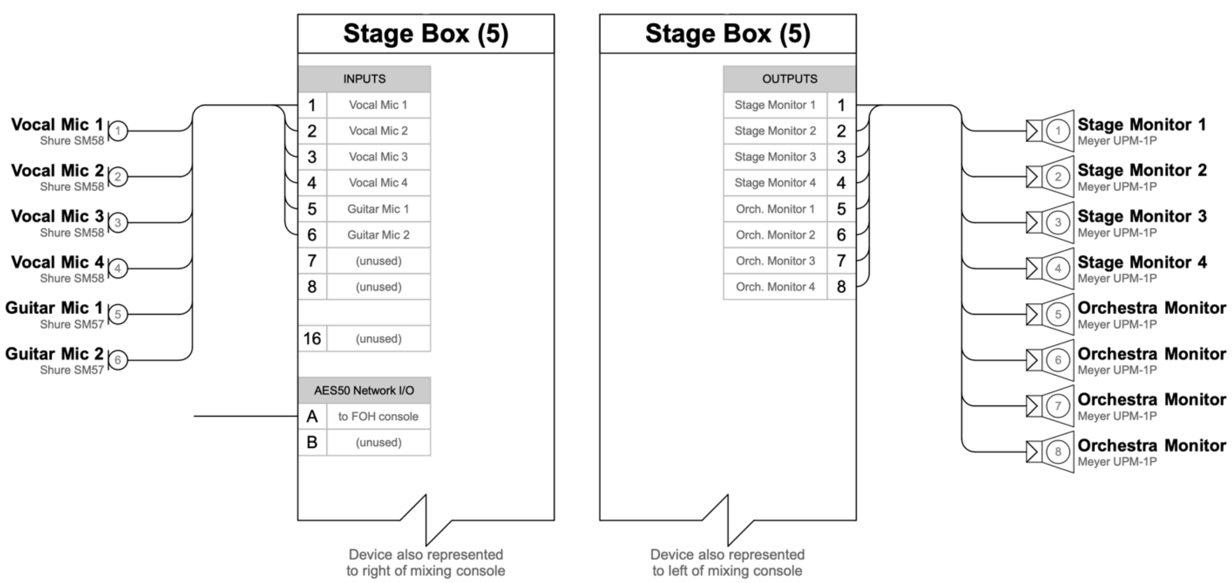


Figure 1.15.2: Example of break line on bottom edge of device blocks

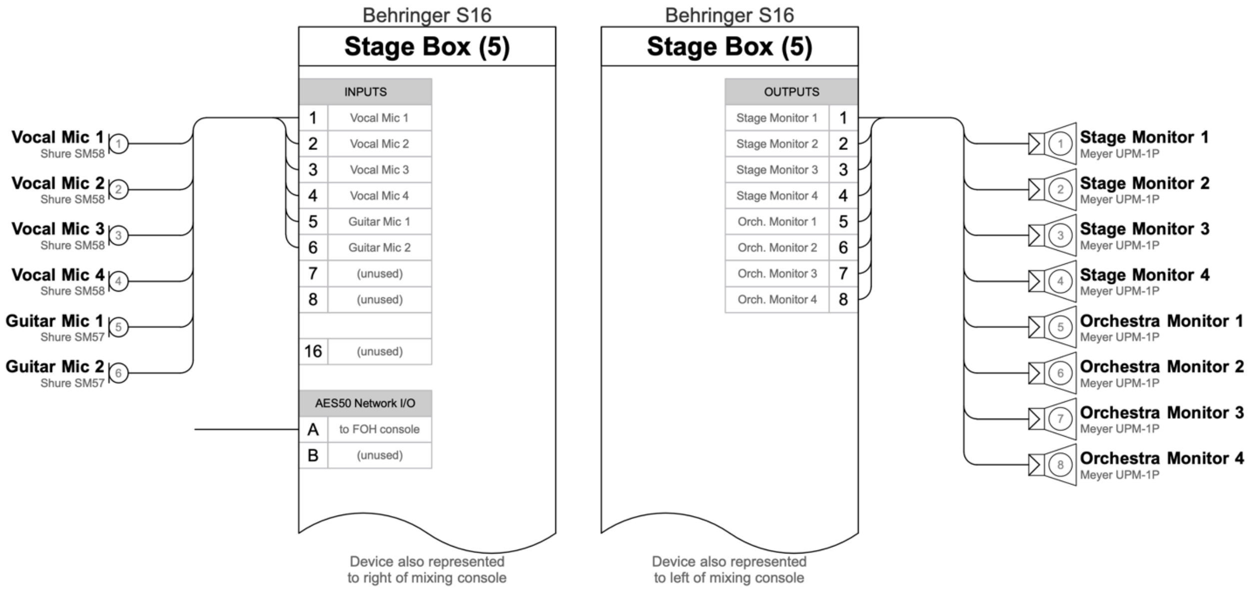


Figure 1.15.3: Example of curved line on bottom edge of device blocks

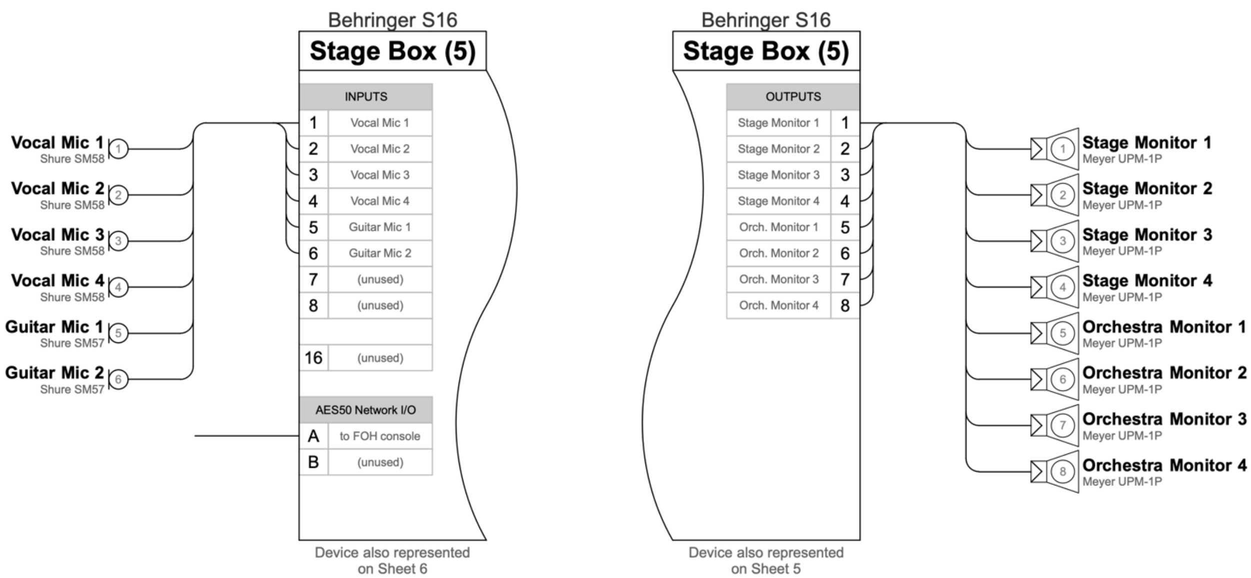


Figure 1.15.4: Example of curved line on side edge of device blocks

1.16) Wireless Systems

Wireless audio signals are commonly represented in SBDs with symbols that resemble lightning bolts or longitudinal waves.

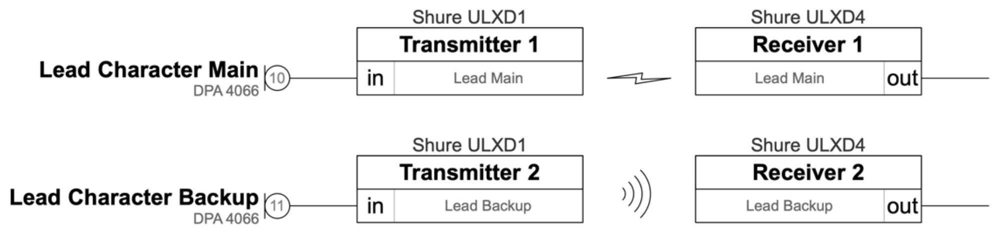


Figure 1.16.1: Example showing two types of wireless signal symbols in use

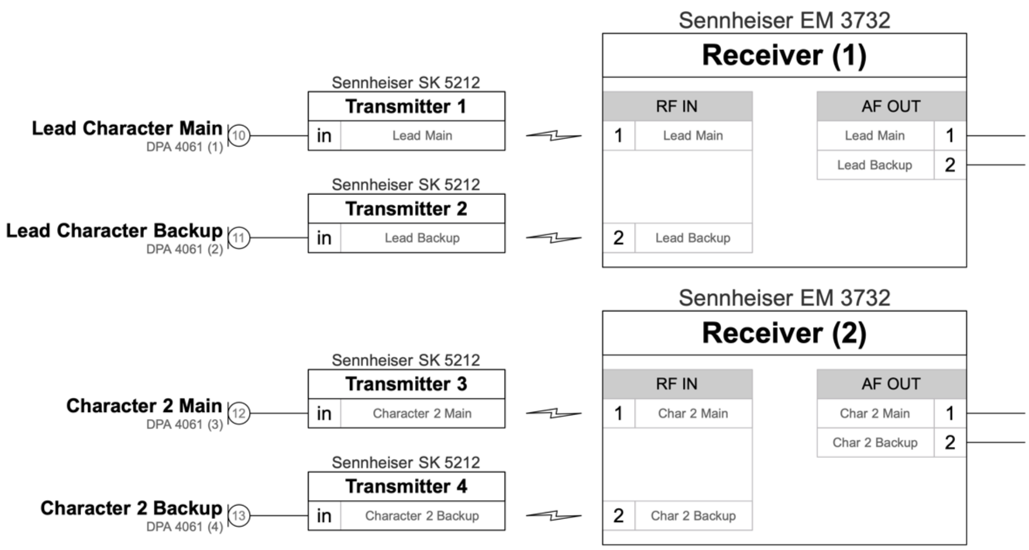


Figure 1.16.2: Example showing multiple wireless units

1.17) Antenna Distribution

Antenna distribution can be represented as part of the overall SBD, but is sometimes drawn as a separate plate for clarity. In the below example, the antennae are drawn in the shape of the intended real antenna (a directional "paddle" antenna) to aid in clarity.

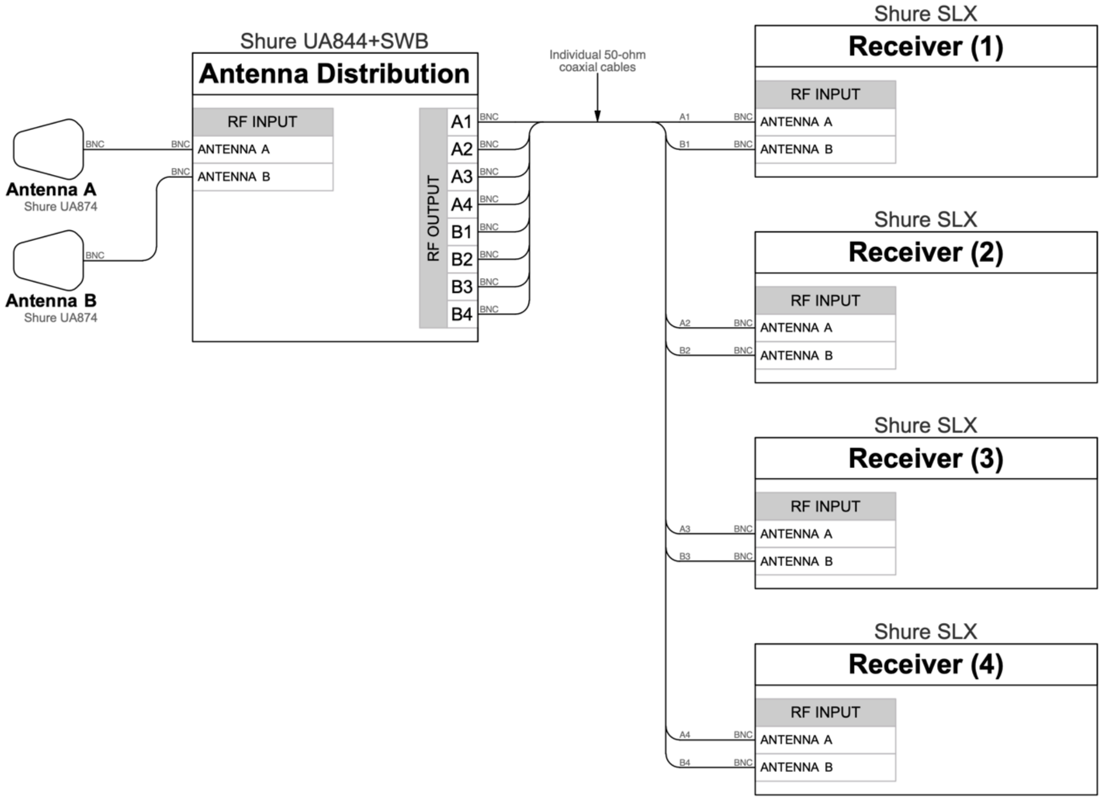


Figure 1.17.1: Example antenna distribution

2. Plan, Section, and Elevation Views

2.1) Basic Configuration

Plan: to-scale drawing from an overhead view
Section: to-scale drawing from a side view
Elevation: to-scale drawing from a frontal view

The purpose of drafting a plan, section, and elevation is to communicate the physical locations of the components of the sound system and how they relate to other elements of the project. These drawings should always be drawn to scale so that potential issues with sightlines, other equipment, lighting/projection angles, and safety can be properly identified by all members of the project team. Each view should clearly state from which perspective it is drawn. Refer to USITT scenic recommendations for suggested use of callouts and section markers.

The plan (or ground plan) should be clearly laid out in a document that also contains as many other components of the project (scenery, lighting, projection, building structures, etc) as possible. Speakers, hardware, and (depending on the needs of the project) cable paths and power components should all be represented. Many technical drawing programs have speaker symbols available in their libraries, and speaker manufacturers offer free downloads of CAD symbols online. If no manufacturer symbol is available, making one from scratch is relatively simple utilizing manufacturer data on the product.

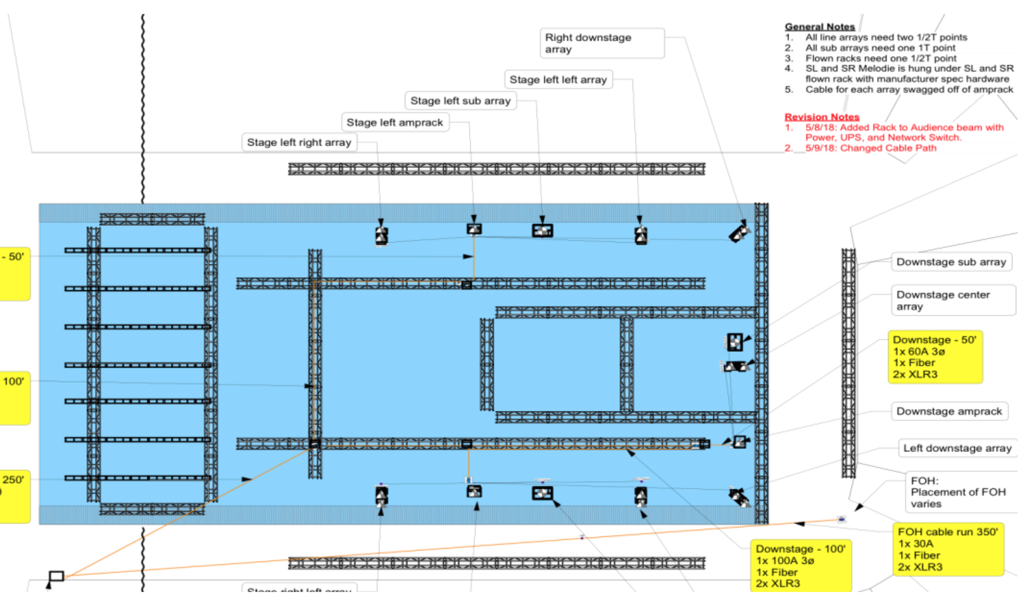


Figure 2.1.1: Example plan view (detail)

Drawing representations of speaker coverage can assist in the calculation of nominal throw and coverage angles. This can be extremely helpful in the early phases of sound system design.

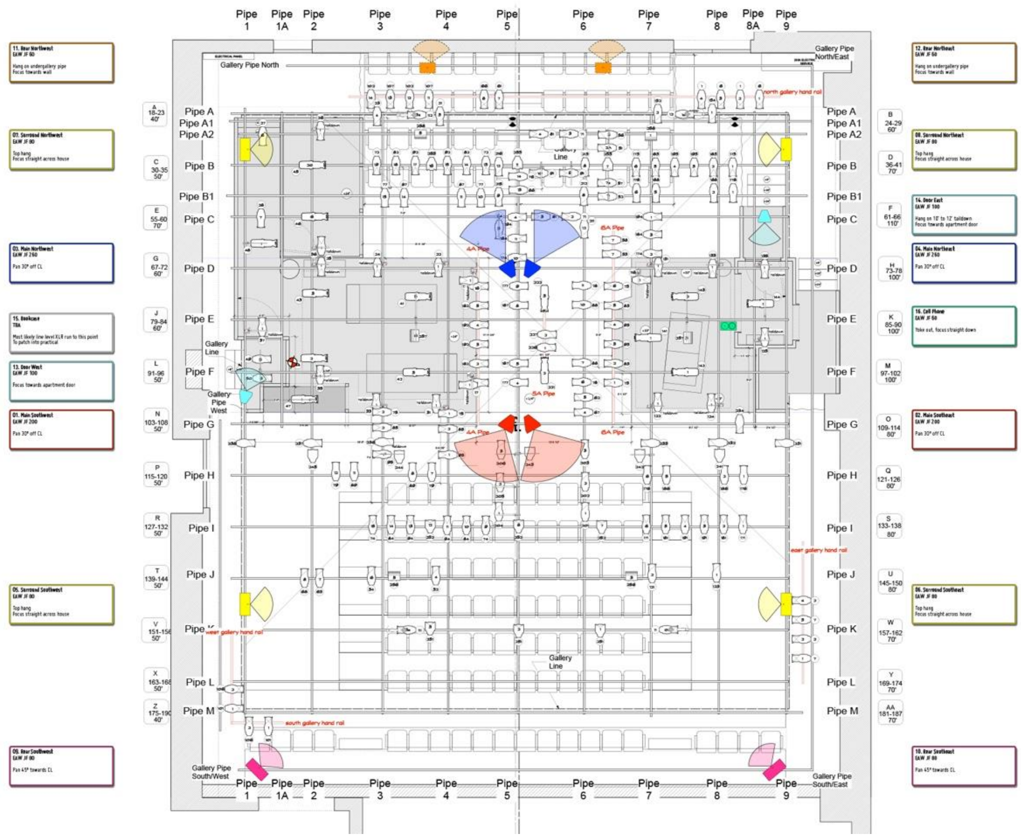


Figure 2.1.2: Example plan view with callout scheme distinct from Figure 2.1.1, and with small coverage cones shown for each loudspeaker

Along with speakers, cables, and other equipment, it can be useful for drawings to include explanatory text, labels, and equipment numbering schemes. For clarity, it is recommended that any such text or labels be placed in the drawing as a separate layer/class so they can be toggled on and off. Additionally, it is essential that any such text or labels are consistent across the entire paperwork package. If a particular speaker is referred to as "Speaker #6" on the plan view, it should be referred to as "Speaker #6" in all paperwork.

In the section view, proper placement and scale, as well as other relevant information (speaker heights, weights, angles, distance from walls or other barriers, etc.) will be beneficial assist in predicting potential hazards. Lighting instrument throws, moving scenery, AC ducts, etc. can all be hazards for rigging and/or get in the way of your speaker throw.

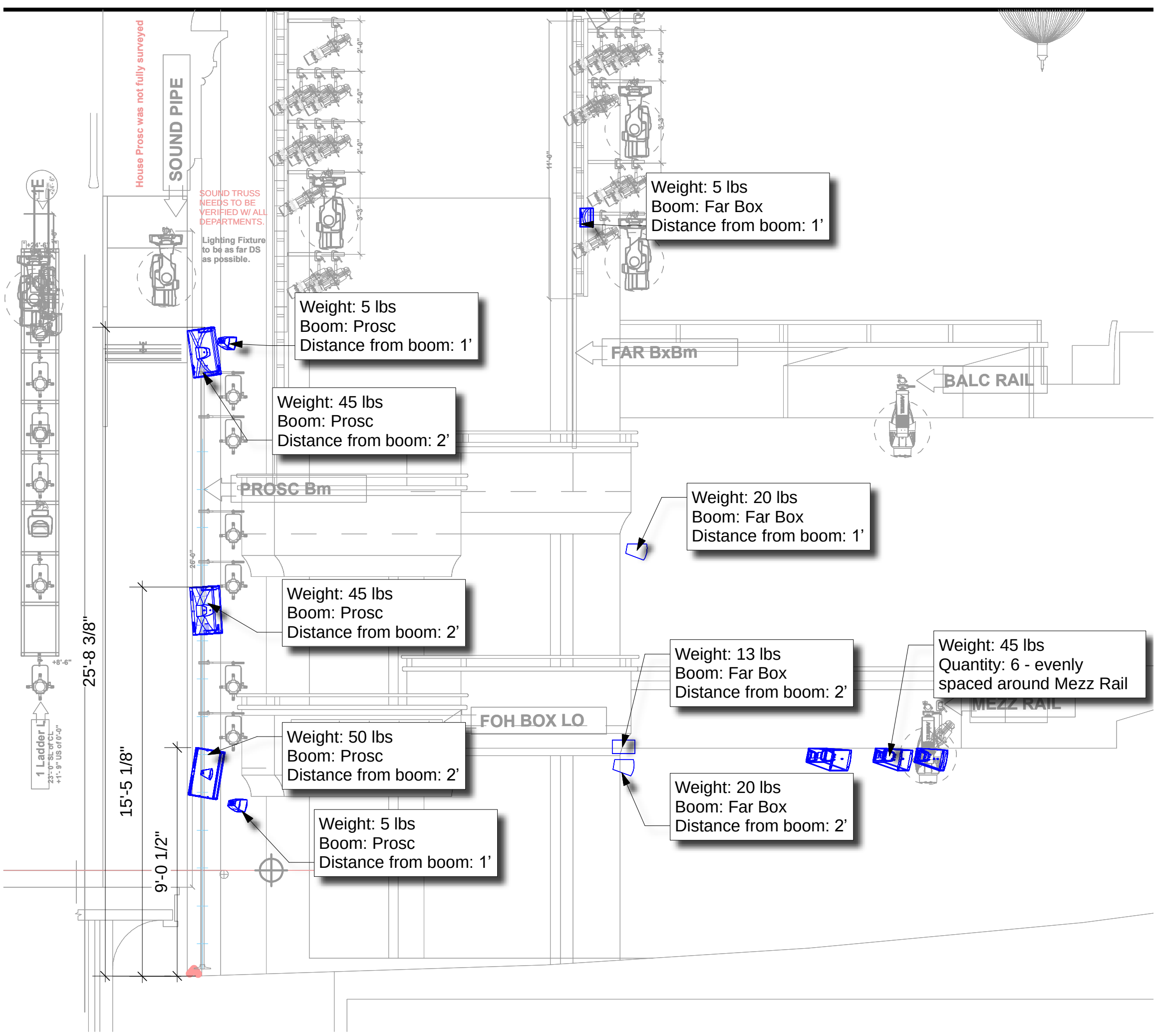


Figure 2.1.3: Example side section view

2.2) Layers

Using layers, classes, or other categorizations in your drawing facilitates clearer use of the drawing. The ability to toggle off all of the lights (for example), using your drafting software (viewports, layers, etc,) can be very helpful for clarifying the exact details of a sound installation.

2.3) Build Drawings

Build drawings are layouts that contain only information relevant for installation of the equipment (where design drawings might contain more info about intended use of each component, or illustrations of speaker coverage areas, for example). For the build and installation of your plot, a ground plan view with simple speaker symbols and labels may be sufficient. Figure 2.5.1 shows some basic rigging information, but lacks specificity. This is intentional, as detailed rigging drawings are not always necessary. If cable paths and/or rigging are determined prior to installation, draw these into the plot and label accordingly. Differentiate different types of cable (by line weight, color, dashed/dotted line, or another method. These differentiations should be clearly identified in the legend).

2.4) Line Weight and Shading

Any use of line weights and shading should be clearly identified in the legend, and should be definitive enough so as to avoid misinterpretation by others reading the document. Excessive shading, or very subtle differences in line weight, can be difficult to read and risks important information being misunderstood.

2.5) Other Departments' Drawings

Integrating other departments' drawings into the sound paperwork is a useful tool in making sure the system plans will fit into the production as a whole. It allows the visualization of the location of scenery, lights, projectors, and other equipment--all of which can help to preempt spacing problems in the venue. These details may be displayed in halftone or greyed out view to clarify emphasis on sound devices.

Other departments may not have drawings ready to be incorporated by the time sound drawings are due, but close coordination with the other design and production departments can help ensure that sound is able to claim the mounting positions needed. Plan and elevation view drawings are principally communication tools to allow all departments to collaborate on the overall product well in advance of physical installation.

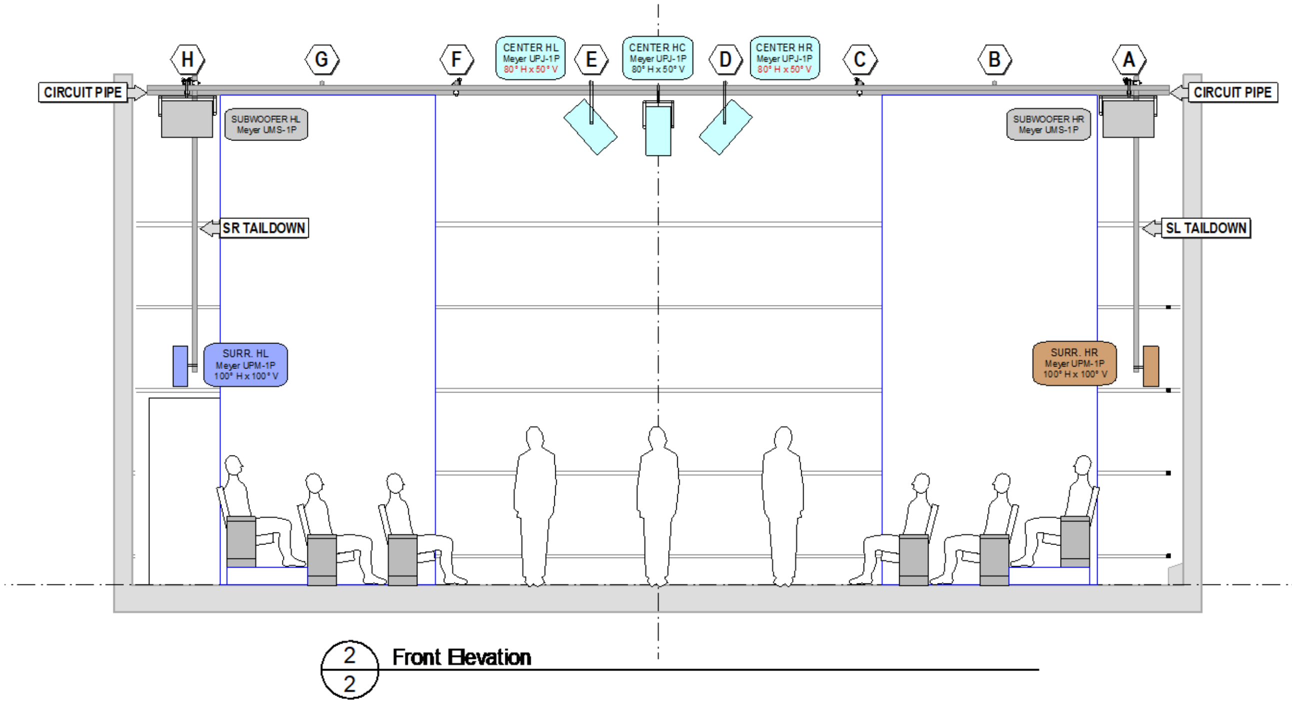


Figure 2.5.1: Example front elevation view

3. Hookups

3.1) Hookup Overview

The hookup of a sound system is outlined through a series of block diagrams and/or data sheets defining various parts of both the physical cabling, precise patch points, and digital interconnections. They are often sub-sections or more detailed plates of a greater System Block Diagram. Various systems will require a combination of any or all of the different hookups - sometimes combining several hookups onto a single document. It is the responsibility of the system designer to properly outline as much information as necessary to clearly detail the system requirements.

Hookup diagrams could include:

- Individual gear internal patching
- Digital interconnection and patching
- Cable hookups

3.2) Individual Gear Internal Patching

Individual pieces of gear often benefit from defined hookup and layout information independent of the system block diagram. This could include console layouts, standalone processors, or outboard matrixes. It is up to the designer and production technicians / engineers to determine what individual plates are required to best complete the execution of the sound system.

Figure 3.2.1 (below) is an example of a console hookup, defining only the input and output of one piece of gear:

Inputs					
I/P		Source	Format	Input ID	Direct Out
1	God Mic 1	Local In #1			
2	God Mic 2	Local In #2			
3	SM VOG	3224 #1 In 1			
4					
5					
6					
7					
8					
I/P		Source	Format	Input ID	Direct Out
9	Bar Mic	3224 #1 In 2			
10	Floor Mic #1	3224 #1 In 3			
11	Floor Mic #2	3224 #1 In 4			
12	Floor Mic #3	3224 #1 In 5			
13	Floor Mic #4	3224 #1 In 6			
14					
15	Reverb Return Left	Local In #7			
16	Reverb Return Right	Local In #8			
I/P		Source	Format	Input ID	Direct Out
17	QLab 1	Card 1 In 1			
18	QLab 2	Card 1 In 2			
19	QLab 3	Card 1 In 3			
20	QLab 4	Card 1 In 4			
21	QLab 5	Card 1 In 5			
22	QLab 6	Card 1 In 6			
23	QLab 7	Card 1 In 7			
24	QLab 8	Card 1 In 8			
I/P		Source	Format	Input ID	Direct Out
25	QLab 9	Card 2 In 1			
26	QLab 10	Card 2 In 2			
27	QLab 11	Card 2 In 3			
28	QLab 12	Card 2 In 4			
29	QLab 13	Card 2 In 5			
30	QLab 14	Card 2 In 6			
31	QLab 15	Card 2 In 7			
32	QLab 16	Card 2 In 8			

Outputs			
Groups		Output ID	Destination
1	System Left	Subgroup	
2	System Right	Subgroup	
3	System Center	Subgroup	
4	Front Fills	Subgroup	
5	HL Surround 1	3224 #1 Out 7	Galileo 2-A
6	HL Surround 2	3224 #1 Out 8	Galileo 2-B
7	HL Surround 3	3224 #1 Out 9	Galileo 2-C
8	HR Surround 1	3224 #1 Out 10	Galileo 2-D
9	HR Surround 2	3224 #1 Out 11	Galileo 2-E
10	HR Surround 3	3224 #1 Out 12	Galileo 2-F
11	House Left Rear	3224 #1 Out 13	Galileo 3-A
12	House Right Rear	3224 #1 Out 14	Galileo 3-B
13	Overstage DSL	3224 #1 Out 15	Galileo 3-C
14	Overstage DSR	3224 #1 Out 16	Galileo 3-D
15	Overstage USL	3224 #2 Out 1	Galileo 3-E
16	Overstage USR	3224 #2 Out 2	Galileo 3-F
17	Toilet Speaker	3224 #2 Out 3	Galileo 4-A
18	TV Speaker	3224 #2 Out 4	Galileo 4-B
19	Jukebox	3224 #2 Out 5	Galileo 4-C
20	Sub Left	3224 #2 Out 6	Galileo 1-E
21	Sub Right	3224 #2 Out 7	Galileo 1-F
22			
23	Reverb Send Left	Local Out #7	Verb L In
24	Reverb Send Right	Local Out #8	Verb R In
Matrixes		Output ID	Destination
1	House Mains Left	3224 #1 Out 1	Galileo 1-A
2	House Mains Right	3224 #1 Out 2	Galileo 1-B
3	Center Upper	3224 #1 Out 3	Galileo 1-C
4	Center Lower	3224 #1 Out 4	Galileo 1-D
5	Front Fill Inner	3224 #1 Out 5	Galileo 4-F
6	Front Fill Outer	3224 #1 Out 6	Galileo 4-G
7			
8	Program	3224 #2 Out 8	Program Mixer

Figure 3.2.1 Example of a console hookup

3.3) Digital Interconnection

Digital interconnection outlines the physical patches between digital equipment of a sound system. It does not examine the multitude of individual signal paths running through the digital cable, but rather, the physical connections of the individual digital cables.

It is recommended to specify both the format of digital signal being transmitted as well as the type of cable in use.

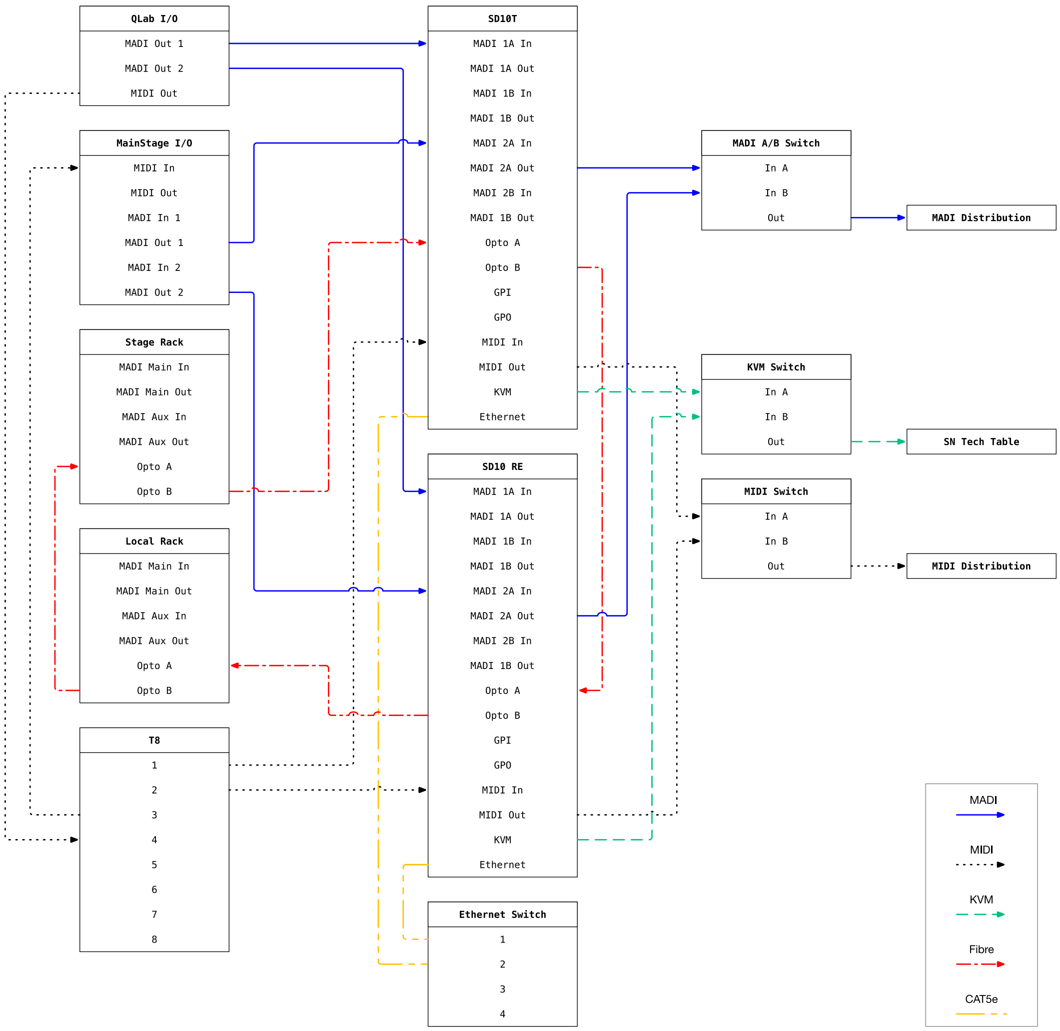


Figure 3.3.1 Example of digital interconnection diagram

If digital interconnect is included as part of a larger block diagram, it is recommended to differentiate the various digital signal flows from the analog ones, often by color and always some other form of notation.

3.4) Digital Patch

Digital Patch paperwork defines the exact signal paths flowing through a single digital cable. If the digital patch is point to point, such as AES3 signals, the patch can be defined in a similar manner as analogue signal flow. However, when multiple patching options are available, such as in a Dante or AES67 signal flow, it is recommended to outline the patching in a grid.

	Dante Transmitters	Transmitter Number	Chl 25 In - QLab 1	Chl 26 In - QLab 2	Chl 27 In - QLab 3	Chl 28 In - QLab 4	Chl 29 In - QLab 5	Chl 30 In - QLab 6	Chl 31 In - QLab 7	Chl 32 In - QLab 8	Chl 33 In - QLab 9	Chl 34 In - QLab 10	Chl 35 In - QLab 11	Chl 36 In - QLab 12	Chl 37 In - QLab 13	Chl 38 In - QLab 14	Chl 39 In - QLab 15	Chl 40 In - QLab 16	Chl 41 In - QLab 17	Chl 42 In - QLab 18	Chl 43 In - QLab 19	Chl 44 In - QLab 20	Chl 45 In - QLab 21	Chl 46 In - QLab 22	Chl 47 In - QLab 23	Chl 48 In - QLab 24	Chl 3 In - SM VOG	Chl 9 - Area Mic #1 In	Chl 10 - Area Mic #2 In	Chl 11 - Area Mic #3 In	Chl 10 - Area Mic #4 In	Chl 11 - Area Mic #5 In	Chl 12 - Area Mic #6 In	Chl 17 - RF Mic #1 In	Chl 18 - RF Mic #2 In	Chl 19 - RF Mic #3 In	Chl 20 - RF Mic #4 In	Chl 21 - RF Mic #5 In	Chl 22 - RF Mic #6 In	Chl 23 - RF Mic #7 In	Chl 24 - RF Mic #8 In	Center - 3224 AES Out #1	Vocal Feed Left - 3224 #1 AES Out #2	Vocal Feed Center - 3224 #1 AES Out #3	Vocal Feed Right - 3224 #1 AES Out #4	House Mains Left - 3224 #1 AES Out #5	House Mains Right - 3224 #1 AES Out #6	Delay FX - 3224 #1 AES Out #7	Vocal Feed Left - 3224 #1 AES Out #8	Surround Left - 3224 #1 Main Out #1	Surround Center - 3224 #1 Main Out #2	Surround Right - 3224 #1 Main Out #3	Vocal Feed Center - 3224 #2 AES Out #1	Vocal Feed Right - 3224 #2 AES Out #2	Flown Subs - 3224 #2 AES Out #3	Onstage Subs - 3224 #2 AES Out #4	Onstg Upper USR (HL) - 3224 #2 AES Out #5	Onstg Upper USL (HR) - 3224 #2 AES Out #6	Onstg Lower DSR (HL) - 3224 #2 AES Out #7	Onstg Lower DSL (HR) - 3224 #2 AES Out #8
Dante Receivers			Console Dante Inputs																																						3224 #1 Dante Inputs											3224 #2 Dante Inputs							
Receiver Number			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8
QLab Main Out 1 - Main HL	QLab Main Computer Dante Outputs	1	x																																																								
QLab Main Out 2 - Main HR		2		x																																																						
QLab Main Out 3 - Main C		3			x																																																					
QLab Main Out 4 - Surround Side L		4				x																																																				
QLab Main Out 5 - Surround Center		5					x																																																			
QLab Main Out 6 - Surround Side R		6						x																																																		
QLab Main Out 7 - Delays		7							x																																																	
QLab Main Out 8 - Overstage Sub		8								x																																																
QLab Main Out 9 - Vom Left		9									x																																															
QLab Main Out 10 - Vom Right		10										x																																														
QLab Main Out 11 - Vom Sub Left		11											x																																													
QLab Main Out 12 - Vom Sub Right		12												x																																												
QLab Main Out 13 -SR Stairs		13													x																																											
QLab Main Out 14 -Center Stairs		14														x																																										
QLab Main Out 15 - SL Upper		15															x																																									
QLab Main Out 16 - Onstage Sub		16																x																																								
QLab Main Out 17 - Offstage HL		17																	x																																							
QLab Main Out 18 - Lower Stairs Left		18																		x																																						
QLab Main Out 19 - Lower Stiars Right		19																			x																																					
QLab Main Out 20 - Offstage HR		20																				x																																				
QLab Main Out 21 - Court Window		21																					x																																			
QLab Main Out 22 - Spare		22																						x																																		
QLab Main Out 23 - Reverb Send		23																							x																																	
QLab Main Out 24 - Program		24																								x																																		
QLab B/U Out 1 - B/U HL	QLab Backup Computer Dante Output	1	x																																																								
QLab B/U Out 2 - B/U HR		2		x																																																							
QLab B/U Out 3 - B/U C		3			x																																																					
QLab B/U Out 4 - Surround Side L		4				x							Set Up QLab B/U Input as 2nd Scene In Dante Controller																																																	
QLab B/U Out 5 - Surround Center		5					x																																																			
QLab B/U Out 6 - Surround Side R		6						x																																																		
QLab B/U Out 7 - Delays		7							x																																																	
QLab B/U Out 8 - Overstage Sub		8								x																																																
QLab B/U Out 9 - Vom Left		9									x																																															
QLab B/U Out 10 - Vom Right		10										x																																														
QLab B/U Out 11 - Vom Sub Left		11											x																																													
QLab B/U Out 12 - Vom Sub Right		12												x																																												
QLab B/U Out 13 -SR Stairs		13													x																																											
QLab B/U Out 14 -Center Stairs		14														x																																										
QLab B/U Out 15 - SL Upper		15															x																																									
QLab B/U Out 16 - Onstage Sub		16																x																																								
QLab B/U Out 17 - Offstage HL		17																	x																																							
QLab B/U Out 18 - Lower Stairs Left		18																		x																																						
QLab B/U Out 19 - Lower Stairs Right		19																			x																																					
QLab B/U Out 20 - Offstage HR		20																				x																																				
QLab B/U Out 21 - Court Window		21																					x																																			
QLab B/U Out 22 - Spare		22																						x																																		
QLab B/U Out 23 - Reverb Send		23																							x																																	
QLab B/U Out 24 - Program		24																								x																																
SM VOG - 3224 #1 In 1	3224 #1 Dante Out	1																									x																																
Area Mic #1 - 3224 #1 In 2		2																										x																															
Area Mic #2 - 3224 #1 In 3		3																											x																														
Area Mic #3 - 3224 #1 In 4		4																												x																													
Area Mic #4 - 3224 #1 In 5		5																													x																												
Area Mic #5 - 3224 #1 In 6		6																														x																											
Area Mic #6 - 3224 #1 In 7		7																															x																										
RF Mic #1 - 3224 #1 In 8		8																																x																									
RF Mic #2 - 3224 #1 In 9		9																																	x																								
RF Mic #3 - 3224 #1 In 10		10																																		x																							
RF Mic #4 - 3224 #1 In 11		11																																			x																						
RF Mic #5 - 3224 #1 In 12		12																																				x																					
RF Mic #6 - 3224 #1 In 13		13																																					x																				
RF Mic #7 - 3224 #1 In 14		14																																						x																			
RF Mic #8 - 3224 #1 In 15		15																																							x																			
Center - Group 1 Out	Console Dante Output	1																																								x																		
Vocal Feed Left - Group 2 Out		2																																									x																	
Vocal Feed Left - Group 2 Out		3																																																x											
Vocal Feed Center - Group 3 Out		4																																										x																
Vocal Feed Center - Group 3 Out		5																																																				x							
Vocal Feed Right - Group 4 Out		6																																											x															
Vocal Feed Right - Group 4 Out		7																																																					x						
House Mains Left - Group 5 Out		8																																												x														
House Mains Right - Group 6 Out		9																																													x													
Delay FX - Group 7 Out		10																																														x												
Flown Subs - Group 8 Out		11																																																						x					
Onstage Subs - Group 9 Out		12																																																							x				
Onstage Upper SR (HL) - Group 10 Out		13																																																								x			
Onstage Upper SL (HR) - Group 11 Out		14																																																									x		
Onstage Lower SR (HL) - Group 12 Out		15																																																										x	
Onstage Lower SL (HR) - Group 13 Out		16																																																											x
USC Top of Stairs - Group 14 Out		17																																																											
Prison Window - Group 15 Out		18																																																											
Surround Left - Group 16 Out		19																																																x										
Surround Center - Group 17 Out		20																																																	x									
Surround Right - Group 18 Out		21																																																		x								
HL Vom Special - Chl 33 Direct Out		22																																																										
HR Vom Special - Chl 34 Direct Out		23																																																										
HL Vom Sub - Chl 35 Direct Out		24																																																										
HR Vom Sub - Chl 36 Direct Out		25																																																										
IR Feed - Group 23 Out		26																																																										
Program Output - Group 24 Out		27																																																										

Figure 3.4.1 Example of a complete digital patch diagram

	Dante Transmitters	Transmitter Number	Chl 25 In - QLab 1	Chl 26 In - QLab 2	Chl 27 In - QLab 3	Chl 28 In - QLab 4	Chl 29 In - QLab 5	Chl 30 In - QLab 6	Chl 31 In - QLab 7	Chl 32 In - QLab 8	Chl 33 In - QLab 9	Chl 34 In - QLab 10	Chl 35 In - QLab 11	Chl 36 In - QLab 12	Chl 37 In - QLab 13	Chl 38 In - QLab 14	Chl 39 In - QLab 15	Chl 40 In - QLab 16	Chl 41 In - QLab 17	Chl 42 In - QLab 18	Chl 43 In - QLab 19	Chl 44 In - QLab 20	Chl 45 In - QLab 21
Dante Receivers			Console Dante Inpu																				
Receiver Number			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
QLab Main Out 1 - Main HL	QLab Main Computer Dante Outputs	1	x																				
QLab Main Out 2 - Main HR		2		X																			
QLab Main Out 3 - Main C		3			X																		
QLab Main Out 4 - Surround Side L		4				X																	
QLab Main Out 5 - Surround Center		5					X																
QLab Main Out 6 - Surround Side R		6						X															
QLab Main Out 7 - Delays		7							X														
QLab Main Out 8 - Overstage Sub		8								X													
QLab Main Out 9 - Vom Left		9									X												
QLab Main Out 10 - Vom Right		10										X											
QLab Main Out 11 - Vom Sub Left		11											X										
QLab Main Out 12 - Vom Sub Right		12												X									
QLab Main Out 13 -SR Stairs		13													X								
QLab Main Out 14 -Center Stairs		14														X							
QLab Main Out 15 - SL Upper		15															X						
QLab Main Out 16 - Onstage Sub		16																X					
QLab Main Out 17 - Offstage HL		17																	X				
QLab Main Out 18 - Lower Stairs Left		18																		X			
QLab Main Out 19 - Lower Stiars Right		19																			X		
QLab Main Out 20 - Offstage HR		20																				X	
QLab Main Out 21 - Court Window		21																					X
QLab Main Out 22 - Spare		22																					

Figure 3.4.2 - Detail of Figure 3.4.1

3.5) Cable Hookups

Various methods of documenting cable hookups are in use throughout the industry. The needs of an installation project's cable listing are vastly different from the needs of a Broadway production. It is important to use a method suited to the project at hand.

Broadway and touring shows use a series of summaries for the various cables utilized. This includes:

- Individual cable hookup: a listing of single cables run for a specific reason
- Mult cable summary: a listing of multicables used on the show with end-to-end connection information. This does not include the internal individual signal paths.
- Mult detail: a listing specifying the signal paths assigned to the various analogue channels within a mult cable.
- Bundle hookup: a listing of "bundled" cables which are run as a group during load-in, focusing on the geographic termination point at either end of the bundled cable.

Cable Checklist for Group: Com

DSL		**150'**	**Flagged:** **Not Flagged:**		**Bundled/Tested:** ☐ ☐	**Pulled/Labeled/Tested**
cDL	DSL Com	6-Pair, 150'	**Socket:** Com/Vid Rack	**Plug:** DSL		☐ ☐ ☐
DSR		**150'**	**Flagged:** **Not Flagged:**		**Bundled/Tested:** ☐ ☐	**Pulled/Labeled/Tested**
cDR	DSR Com	6-Pair, 150'	**Socket:** Com/Vid Rack	**Plug:** DSR		☐ ☐ ☐
Fly		**200'**	**Flagged:** **Not Flagged:**		**Bundled/Tested:** ☐ ☐	**Pulled/Labeled/Tested**
cFL	Fly Rail Com	6-Pair, 200'	**Socket:** Com/Vid Rack	**Plug:** Fly Rail		☐ ☐ ☐
FOH		**250'**	**Flagged:** **Not Flagged:**		**Bundled/Tested:** ☐ ☐	**Pulled/Labeled/Tested**
cFH	FOH Com	6-Pair, 250'	**Socket:** Com/Vid Rack	**Plug:** FOH Utility		☐ ☐ ☐
Not in Bundles						**Pulled/Labeled/Tested**
cL1	Tech lighting 1	6-Pair, 25'	**Socket:** Tech Rack	**Plug:** LD		☐ ☐ ☐
cL2	Tech lighting2	6-Pair, 25'	**Socket:** Tech rack	**Plug:** LD		☐ ☐ ☐
cL3	Tech lighting3	6-Pair, 25'	**Socket:** Tech rack	**Plug:** LD		☐ ☐ ☐
cL4	Tech lighting4	6-Pair, 25'	**Socket:** Tech rack	**Plug:** LD		☐ ☐ ☐
cJ	Com Jump	9-Pair, 25'	**Socket:** Com/Vid Rack	**Plug:** Stage Rack		☐ ☐ ☐

Figure 3.5.1: Example of a partial mult summary listing

Mult Detail

Band B: bB **Model:** 19-Pair, 100' Pulled: ☐ Labeled: ☐
Socket End: Pit Rack
Plug End: Stage Rack

1	**Toys 2**	*from* e604	*to* Band Rio 1
2	**Toys 3**	*from* e604	*to* Band Rio 2
3	**Djembe**	*from* MD-421 II	*to* Band Rio 3
4	**Reed 1 Upper**	*from* KM184	*to* Band Rio 4
5	**Reed 1 Alto Sax**	*from* KM184	*to* Band Rio 5
6	**Reed 1 Lower**	*from* KM184	*to* Band Rio 6
7	**Reed 2 Upper**	*from* KM184	*to* Band Rio 7
8	**Reed 2 Tenor Sax**	*from* KM184	*to* Band Rio 8
9	**Reed 2 Lower**	*from* KM184	*to* Band Rio 9
10	**Trumpet**	*from* R-121 Live	*to* Band Rio 10
11	**Acoustic Guitar**	*from* C-414	*to* Band Rio 11

Figure 3.5.2: Example of mult detail in list form

Cable Checklist for Group: Bundles

Surround Orch		**200'**	**Flagged:** / **Not Flagged:**		**Bundled/Tested:** ☐ ☐	**Pulled/Labeled/Tested**
Surround Orch 1	sA1	NL8, 200'	*(@ Amp Rack 2)*	*(@ Orch Surr L)*		☐ ☐ ☐
Surround Orch 2	sA2	NL8, 200'	*(@ Amp Rack 2)*	*(@ Orch Surr R)*		☐ ☐ ☐
Surround Orch 3	sA3	NL8, 200'	*(@ Amp Rack 2)*	*(@ Orch Surr Rear)*		☐ ☐ ☐
Tech		**100'**	**Flagged:** / **Not Flagged:**		**Bundled/Tested:** ☐ ☐	**Pulled/Labeled/Tested**
Tech Com	cT	19-Pair, 100'	**Socket:** Tech Distro	**Plug:** FOH Utility		☐ ☐ ☐
Tech Sound QLite		Edison, 100'	**Plug:** Tech Distro	**Socket:** FOH Utility		☐ ☐ ☐
Tech Video A		Ethercon, 100'	*(@ FOH Utility)*	*(@ Tech Distro)*		☐ ☐ ☐
Tech Video B		Ethercon, 100'	*(@ FOH Utility)*	*(@ Tech Distro)*		☐ ☐ ☐
Tech Video spare		Ethercon, 100'	*(@ FOH Utility)*	*(@ Tech Distro)*		☐ ☐ ☐
Tech PD		L6-30, 100'	**Plug:** FOH Utility	**Socket:** Tech Distro		☐ ☐ ☐
Underbalcony 1		**200'**	**Flagged:** / **Not Flagged:**		**Bundled/Tested:** ☐ ☐	**Pulled/Labeled/Tested**
Underbalc Delay 1	sU1	NL8, 200'	*(@ Amp Rack 1)*	*(@ Balcony Rail)*		☐ ☐ ☐
Underbalc Delay 3	sU3	NL8, 200'	*(@ Amp Rack 1)*	*(@ Balcony Rail)*		☐ ☐ ☐

Figure 3.5.3: Example bundle summary listing

4. Routing

4.1) Routing Overview

In the age of digital sound systems, the options available for signal routing within a single digital device (not to mention the system as a whole) are plentiful. This kind of information is often simply shown by means of tables. This kind of paperwork is most necessary for documenting the setup of digital mixing consoles and DSP processors (other kinds of digital gear may call for this kind of paperwork, but will not be examined in detail here). These documents guide the installation and programming crew as to how to program the devices in question.

4.2) Console Routing

Console routing generally falls into one of five categories:

- Input source routing: from stage boxes or onboard inputs to channels
- Input destination routing: from channels to output paths within the console
- Matrix routing: output paths often used for multiple layers of mic signal delay in musicals
- Physical output routing: output paths (including the main mix, subgroups, aux sends to monitors or effects, etc.) and their connection to physical outputs
- Control group assignments: not technically signal routing, but assignments to control groups such as DCA/VCAs (Digital Control Amplifiers or Virtual Control Amplifiers--originally Voltage Controlled Amplifiers in analog consoles) and Mute Groups

Figure 4.2.1 shows a typical input destination routing table:

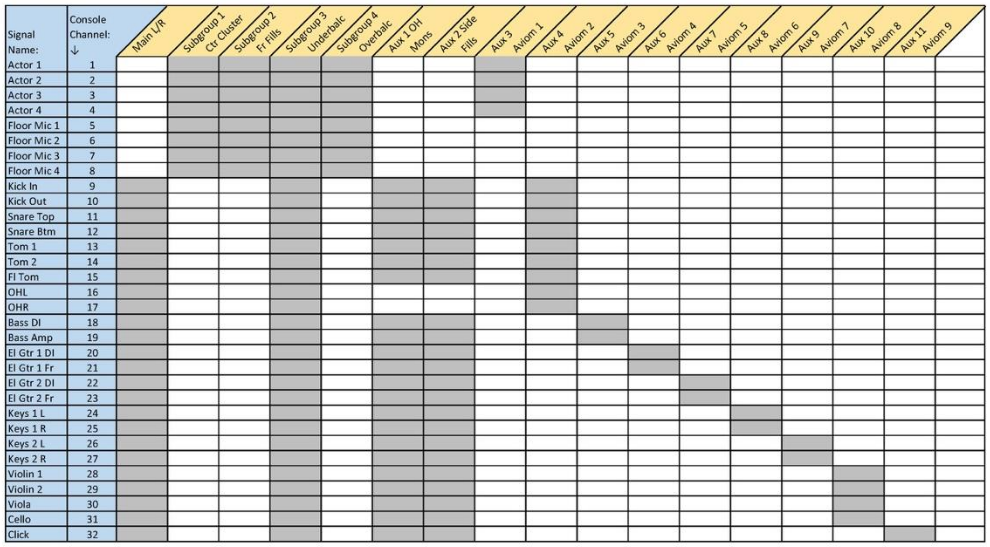


Figure 4.2.1: Example input destination routing

As shown, this table shows the default routing for each console channel's signals. Such a document can specify relative levels within the cells, but this is often left for actual console programming during technical rehearsals. In the above example, "Aviom" channels refer to personal mixing stations used by orchestra members to create their own monitoring balances in the pit.

Figure 4.2.2 shows a typical matrix routing table:

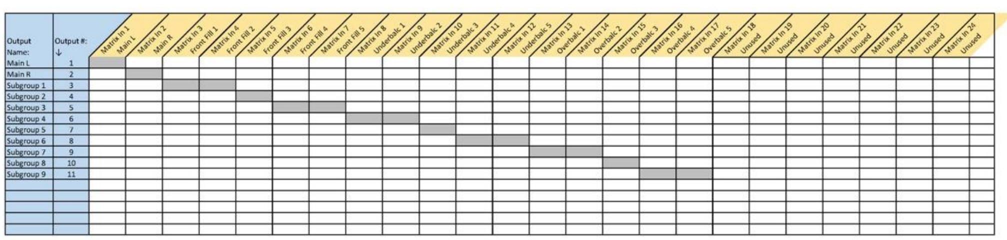


Figure 4.2.2: Example matrix routing

In the above example, Main L and Main R are routed via the matrix to Main L and Main R outputs, where Subgroup 1 is routed to two different Front Fill outputs. These matrix outs might feature level or timing differences from the input signal to each matrix destination. Such info can be listed in the individual cells of a table such as 4.2.3 above, but again is often left to the programming stage of the project. Note that Matrix outs 18-24, while unused, are shown here, to make it simple to add them later in the design process if needed.

Figure 4.2.3 shows a typical physical output routing table:

Signal Name:	Output Channel: ↓	Stagebox 1 Card Slot 1 Output 1	Stagebox 1 Card Slot 1 Output 2	Stagebox 1 Card Slot 1 Output 3	Stagebox 1 Card Slot 1 Output 4	Stagebox 1 Card Slot 1 Output 5	Stagebox 1 Card Slot 1 Output 6	Stagebox 1 Card Slot 1 Output 7	Stagebox 1 Card Slot 1 Output 8	Stagebox 1 Card Slot 2 Output 1	Stagebox 1 Card Slot 2 Output 2	Stagebox 1 Card Slot 2 Output 3	Stagebox 1 Card Slot 2 Output 4	Stagebox 1 Card Slot 2 Output 5	Stagebox 1 Card Slot 2 Output 6	Stagebox 1 Card Slot 2 Output 7	Stagebox 1 Card Slot 2 Output 8	
Main L	Main L (1)	■																
Main R	Main R (2)		■															
Matrix 1	13			■														
Matrix 2	14				■													
Matrix 3	15					■												
Matrix 4	16						■											
Matrix 5	17							■										
Matrix 6	18								■									
Matrix 7	19									■								
Matrix 8	20										■							
Matrix 9	21											■						
Matrix 10	22												■					
Aux Send 1	28													■				
Aux Send 2	29														■			
Aux Send 3	30															■		
Aux Send 4	31																■	

Figure 4.2.3: Example physical output destination routing

In the above example, each output path in the console is shown at left routing to a physical output patch on a stage box. Note that in this example, the outputs are physically connected not just to numbered stage box outputs, but to specific card slots within that stage box. They are listed here, but if the console in question designates the physical output point in a different manner than what is shown here, the naming conventions should always match what the console calls each patch point.

Figure 4.2.4 shows a typical VCA assign table for a particular scene:

Signal Name:	Console Channel: ↓	VCA 1 Wireless Actors	VCA2 Floor Mics	VCA 3 Drums	VCA 4 Bass	VCA 5 Guitars	VCA 6 Keys	VCA 7 Strings	VCA 8 Rhythm Section	VCA 9 Melodic Instruments	
Actor 1	1	■									
Actor 2	2	■									
Actor 3	3	■									
Actor 4	4	■									
Floor Mic 1	5		■								
Floor Mic 2	6		■								
Floor Mic 3	7		■								
Floor Mic 4	8		■								
Kick In	9			■					■		
Kick Out	10			■					■		
Snare Top	11			■					■		
Snare Btm	12			■					■		
Tom 1	13			■					■		
Tom 2	14			■					■		
Fl Tom	15			■					■		
OHL	16			■					■		
OHR	17			■					■		
Bass DI	18				■				■		
Bass Amp	19				■				■		
El Gtr 1 DI	20					■				■	
El Gtr 1 Fr	21					■				■	
El Gtr 2 DI	22					■				■	
El Gtr 2 Fr	23					■				■	
Keys 1 L	24						■			■	
Keys 1 R	25						■			■	
Keys 2 L	26						■			■	
Keys 2 R	27						■			■	
Violin 1	28							■		■	
Violin 2	29							■		■	
Viola	30							■		■	
Cello	31							■		■	
Click	32										

Figure 4.2.4: Example VCA Assignments

The above example shows some typical VCA assignments, as well as overlapping assignments (such that the drums, for example, appear in both the "Drums" and "Rhythm Section" VCAs).

4.3) DSP Routing

DSP routing tables are often very similar to console routing tables. They display physical and digital signal inputs routed to paths within the DSP, matrices and other routing paths within the DSP, and the connections from output paths to physical outputs (where applicable--some signal paths might be digital into the DSP from the console, and digital out of the DSP to the amplifiers, in which case all signals listed are digital).

As such, the examples above in section 4.2 provide plenty of suggestions as to how to go about setting up routing tables for a DSP. Care should always be taken to detail card slots, and to match any numbering or lettering designations in the tables (as well as naming of processing paths and objects) exactly as they will be found within the DSP unit.

5. Wireless Microphone (RF) Tracking/Schedules

Wireless microphone documentation tracks which performers need mics (and during which scenes/acts), as well as what devices and transmission frequencies each mic will use.

5.1) Performer Tracking

A performer tracking schedule lists actors (it is up to the system designer/engineer whether to list these by actor name or character name), and when they will need mics.

Act	Scene	Actor 1	Actor 2	Actor 3	Actor 4	Actor 5	Actor 6	Actor 7	Actor 8	Actor 9
1	1									
1	2									
1	3									
1	4									
1	5									
1	6									
1	7									
1	8									
1	9									
1	10									
2	1									
2	2									
2	3									
2	4									
2	5									
2	6									
2	7									
2	8									
3	1									
3	2									
3	3									
4	1									
5	1									
5	2									
5	3									
5	4									
5	5									
5	6									
5	7									
5	8									

Figure 5.1.1: Example actor mic tracking sheet

5.2) Mic Tracking

A mic tracking schedule (also known as an RF schedule) lists relevant info about performer mics, including (but not limited to):

- Actor
- Character(s)
- Mic element type
- Mic element color
- Mic transmitter type
- Mic receiver
- Mic fit/rigging notes

Mic #	Transmission Frequency	Character	Actor	Element	Cap/Color	Transmitter	Receiver	Fit/Rigging:	Notes:
1	554.025	Hero	Bob	DPA 4061	Beige/Beige	ULXD1 - 1	ULXD4Q - 1	Crown/halo	
2	555.025	Villain	Steve	DPA 4061	Beige/Brown	ULXD1 - 2	ULXD4Q - 1	L ear, tape, blonde wig clip	
3	557.025	Guard #1	Harry	DPA 4061	Black/Beige	ULXD1 - 3	ULXD4Q - 1	Changes (see bible)	
4	558.025	Guard #2	Lucy	DPA 4061	none/Black	ULXD1 - 4	ULXD4Q - 1	R ear, floral/blk Hellerman	
5	560	Best Friend	Angela	DPA 4061	Beige/Beige	ULXD1 - 5	ULXD4Q - 2	Crown/halo	
6	561.025	Sidekick	Garth	DPA 4061	Beige/Beige	ULXD1 - 6	ULXD4Q - 2	Hatbrim, elastic web	
7	563.025	Dancer	Aaron	DPA 4061	Beige/Brown	ULXD1 - 7	ULXD4Q - 2	Crown/halo	
8	564.025	Bartender	Liam	DPA 4061	Black/Beige	ULXD1 - 8	ULXD4Q - 2	Crown/halo	
9	565.025	Ghost	Mark	DPA 4061	none/Black	ULXD1 - 9	ULXD4D - 1	L ear, visible boom	
10	567.025	Ghoul	Joe	DPA 4061	Beige/Beige	ULXD1 - 10	ULXD4D - 1	L ear, visible boom	

Figure 5.2.1: Example mic tracking schedule

5.3) RF/Mic Bible

The RF crew will also need to produce a workbook (colloquially referred to as a “bible” on many productions) that will stay at the RF dressing station backstage. Sheets in this workbook will detail the mic setup for each performer, including a photo of rigged mic positions and dressing details, and other relevant info.

Actor		Character	
Actor 1		Character 1	
Costume Notes	Has a belt for waist pack.		
Wig / Hair Notes			
Element	2- MKE-1s	Transmitter Location	Waist & in Wig
Element Color	Beige	Element Location	Forehead (center)
Rigging Notes	Wire wrap for stability that extends 2" from the tip of the elements. Then 2 Small Tensoplast stoppers, the 1st at 3" and the 2nd offset by a ½". Slack is wrapped up in a Hellermen H30.		

Actor		Character	
Actor 2		Character 2	
Costume Notes	Has a chest harness for mic.		
Wig / Hair Notes			
Element	DPA	Transmitter Location	middle back-harness
Element Color	Coco	Element Location	Forehead (center)
Rigging Notes	Has a double sided halo, wire wrap (1 & 7/8" long) and then a tensoplast wrap at the base of the cap as a precaution for sweat. Wire is also colored black for 14.5" after a 1½" tail down. Slack is wrapped in Hellermen H30.		

Actor		Character	
Actor 3		Character 3	
Costume Notes			
Wig / Hair Notes	Locomotion wig's bangs can be problematic. Check first if mic is having pops. etc.		
Element	2- MKE-1s	Transmitter Location	Waist & in Wig
Element Color	Beige	Element Location	Forehead (center)
Rigging Notes	Has wire wrap for stability approximately 2 ½ " long & then 4 tensoplast "stoppers" for pinning to wig prep just offset from each other. Slack is wrapped in a Hellermen H30.		

Actor		Character	
Actor 4		Character 4	
Costume Notes			
Wig / Hair Notes	WYSLMT wig's bangs can be problematic. Check this first if mic is having pops. etc. She is aware and usually fixes this herself.		
Element	DPA	Transmitter Location	in Wig
Element Color	Coco	Element Location	Forehead (center)
Rigging Notes	Has wire wrap for stability approximately 2 ½ " long & then 3 tensoplast "stoppers" for lock in to wig prep just offset from each other. Slack is wrapped in a Hellermen H30.		

Wireless Detail Sheet Page: 1 of 6

Figure 5.3.1: Example RF bible page

6. IP Schedules

6.1) Networking Overview

An ever-increasing number of parts of modern sound systems are, essentially, computers. Digital audio consoles, outboard processing equipment, feature-rich amplifiers, and of course traditional personal computers can all be interconnected using a local area network (LAN), and on all but the simplest shows, it's usually worthwhile to do this. When the number of devices, or the complexity of the system, grows large enough, it is recommended that the network be documented just like any other part of the sound system.

Devices on a LAN use a system of addressing called the Internet Protocol, or IP. A full explanation of IP addressing and of IP systems in general is beyond the scope of these recommendations, but a brief discussion is useful in order to get oriented.

6.2) Documenting IP Addresses

When using manually assigned IP addresses, the sound system documentation should include an IP schedule notating these assignments and any other relevant information.

Device Name	Device Type	IP Address	Subnet Mask	Note
QLab Main	Mac Mini	10.0.0.10	255.255.0.0	
QLab Backup	Mac Mini	10.0.0.11	255.255.0.0	
CL5	Sound console	10.0.0.20	255.255.255.0	
Ion	Lighting console	10.101.2.96	255.255.0.0	Sound runs ethercon to lx booth, but lx dept. will handle their IP addressing.
Galaxy	Speaker processor	10.0.0.50	255.255.255.0	

Some devices have more than one network interface, such as a Mac or Windows computer with both an ethernet connection and wifi connectivity. When more than one interface is used, another column is warranted:

Device Name	Device Type	Interface	IP Address	Subnet Mask	Note
QLab Main	Mac Mini	Built-in ethernet	10.0.0.10	255.255.0.0	
QLab Main	Mac Mini	Wi-fi	DHCP	DHCP	"FOH" wifi
Admin	Mac Mini	Built-in ethernet	10.0.0.2	255.0.0.0	
Admin	Mac Mini	USB ethernet	10.0.0.3	255.0.0.0	
Admin	Mac Mini	Wi-fi	DHCP	DHCP	"FOH" wifi

In the case of a system where all devices are deriving their IP addresses via DHCP, a table is sometimes still recommended, just to clarify how to configure those devices.

7. Rack Drawings/Custom Panels

7.1) Rack Elevations

When planning a system that will require custom rack configurations, elevation drawings of those equipment racks are a necessary part of a document package. While there are many factors to consider when choosing the order in which gear should be placed in a rack (including heat dispersion, weight, depth of gear, fan placement, etc.), these are beyond the scope of this document.

Rack drawings are generally laid out in one of two main styles:

1) Indicative--a drawing where each object in the rack is shown in its proper location and scale, but no attempt is made to represent the physical appearance of the equipment.
2) Representative--a drawing where each object in the rack is shown in its proper location and scale, and the images for each object represent the physical appearances of the real-world equipment.

In the case of an indicative rack elevation, each object will be labeled both with the model of device, and with any other designations that might tie it to other production paperwork (e.g. “Amp #3” for the third power amplifier in a rack, that is also labeled “Amp #3” on the block diagram). In the case of a representative elevation, if the equipment in use is visually distinct enough as to cause no confusion between models, the actual model information may be left for a legend to the side of the rack itself, rather than labeling each object. Additional system designations (“Amp #3”) would still need to be noted, typically just to the side of each object in the rack.

Rack drawings generally label the rack by “RU”, which stands for “Rack Units”, where 1RU=1.75”. As such, a 44-space rack will have the numbers 1-44 next to the rack elevation. There is no fixed rule as to whether racks should be numbered beginning with 1 at the top of the rack or beginning with 1 at the bottom of the rack. However, when systems have multiple racks of varying heights, beginning your numbering system at the bottom ensures that the first numeral values are always in the same geometric positions (1 on the ground, counting up), which can be convenient for discussion during installations. Additionally, some rack manufacturers label the RU spaces physically on their racks. If your specified racks include this kind of numbering, number the RU on your drawings according to the convention (starting at top or bottom) that the manufacturer uses.

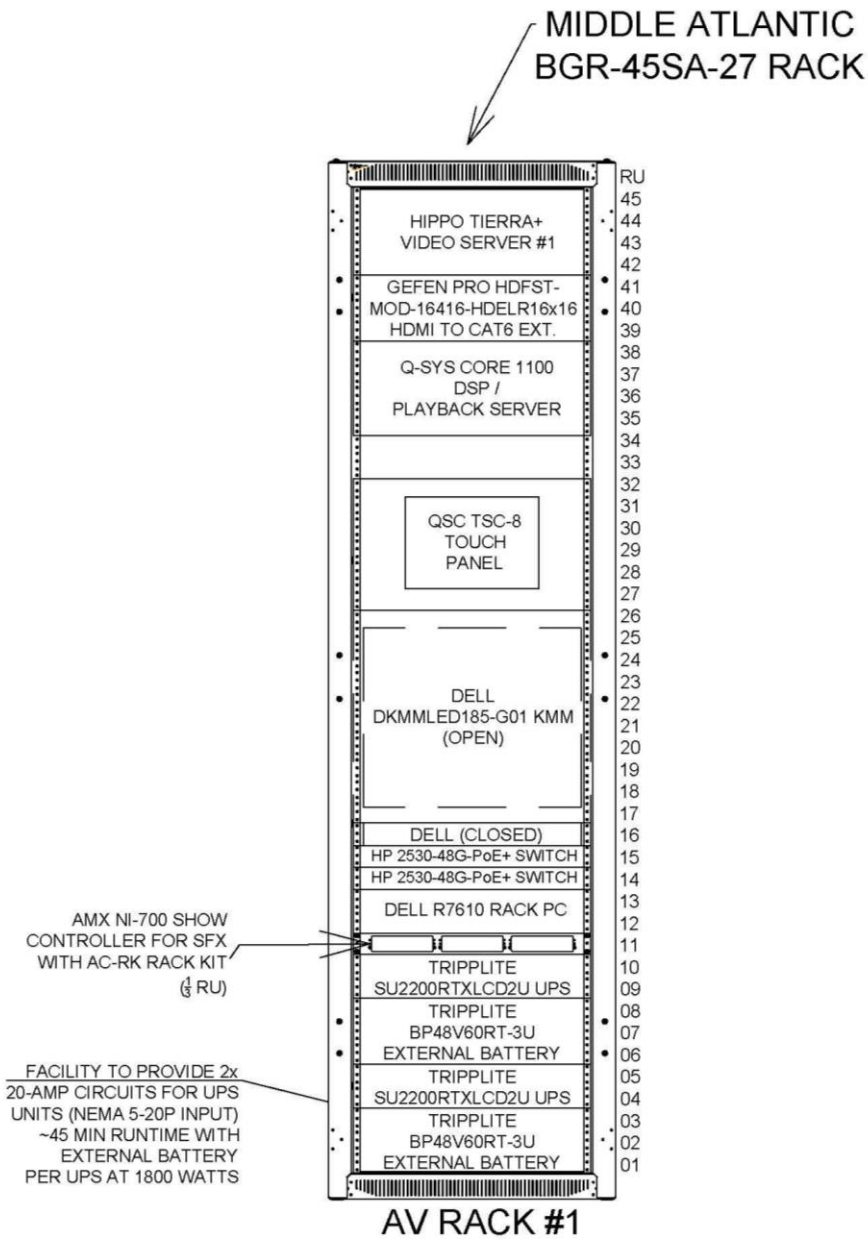


Figure 7.1.1: Indicative rack drawing, RU numbered from bottom

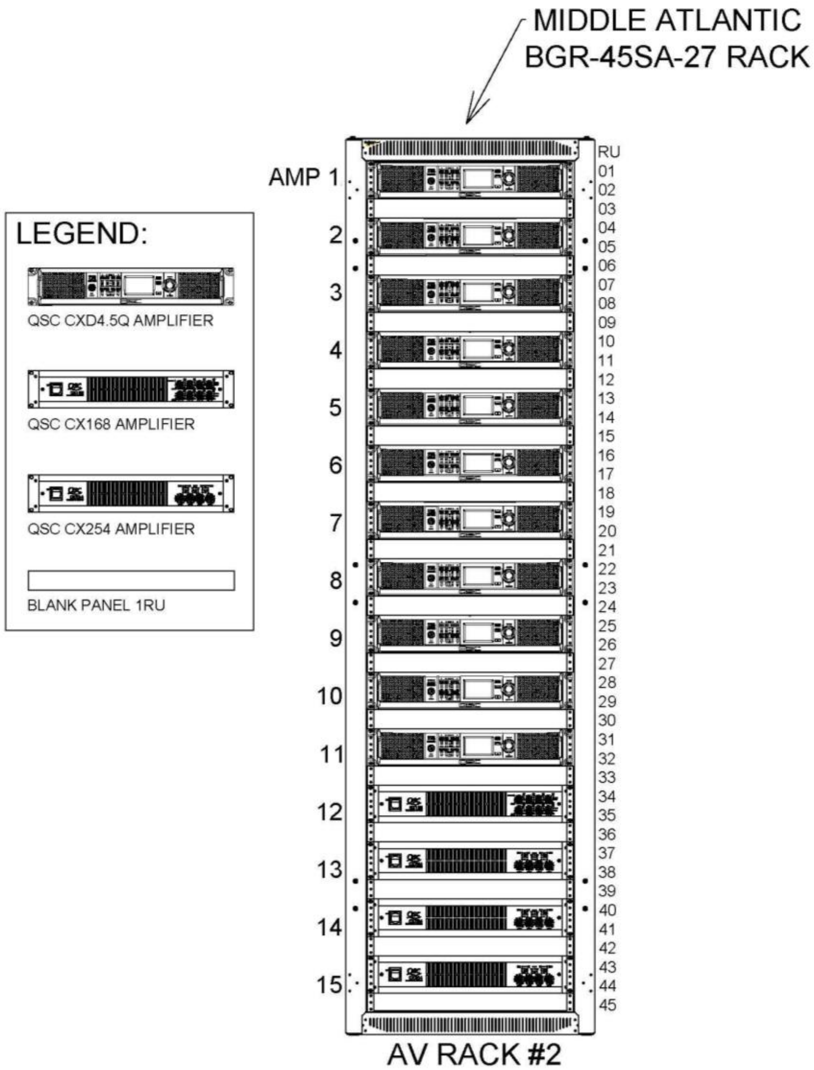


Figure 7.1.2: Representative rack drawing, RU numbered from top
(Note: legend and amp #s shown)

In some cases, it will be advantageous to create additional paperwork (e.g. hookups or block diagrams) for each rack. In that case, refer to previous sections of this document for recommendations on formatting those documents.

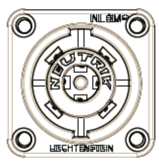
7.2) Custom Panels

The number of different types of Custom Panels available to sound designers and audio engineers is extensive. This document will not make any effort to outline each make or model of panel. Following are a series of steps which can be taken to properly represent connectors on custom panels for current or any future manners of connections.

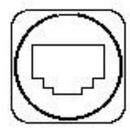
7.2.A) Individual Visual Representation

Any drawing of a custom panel should include a unique and identifiable representation of the connection included in the custom panel. As with overall rack draftings, custom panels can be drawn in either an indicative or representative manner.

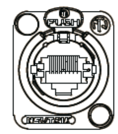
Some samples of visual representation are as follows:



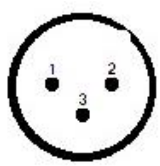
NL-4 connector



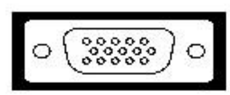
or



RJ45 / Cat5(e) / Cat6 / Ethernet connector

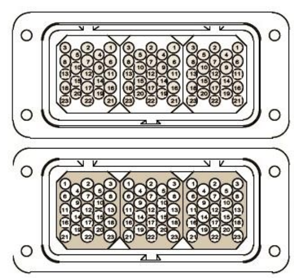


NC3 / XLR pin connector



DE-15 / VGA connector

Socapex 415 / Veam VSC

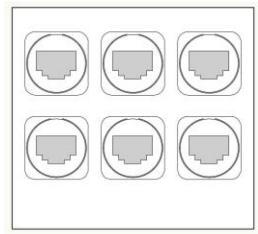


Wireworks MK19
3 G-Block connector (P&S)

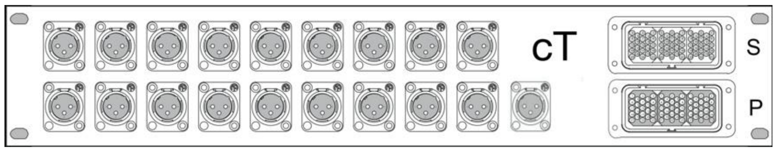
Figure 7.2.A.1: Example panel connectors

7.2.B) Group Visual Representation

Connectors which are packaged together for rack construction should then be combined into group sections. For Example:



6x Ethercon connectors in one panel



2x MK19 connectors & 19x XLR connectors in one panel

Figure 7.2.B.1: Example panel layouts

7.2.C) Additional information

Any additional information required to clarify and properly interconnect the custom panel should be added to the visual representation, including:

- Type of connector (plug or socket)
- Name or indicator of the connection
- Special instructions regarding installation

7.2.D) Inclusion into Rack Drawing

Completed panels should then be included into the overall rack drawing. It is most important to accurately represent the space required for the panel. For Example:

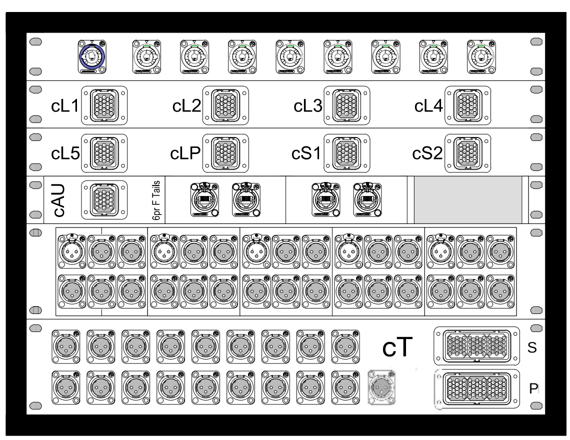


Figure 7.2.D.1: Example panels in rack elevation

8. Intercom and CCTV (Closed Circuit Television)

8.1) Audio Com

The production intercom design is a critically important element of a system design. It is integral to a smooth-running and safe production. Without production intercom, tech rehearsals can't begin, cues can't be called, and stagehands cannot collaborate. It is important to plan accordingly and implement the plan with the input of all departments.

It is beyond the scope of this document to dig too deeply into production intercom systems, but once the needs of the system are determined, lay out and document the system with the same principles referenced previously in this document.

It is important to communicate with all departments and find out their communication needs. Intercom systems may range from small-scale "legacy" systems to large-scale digital systems. In either case, important information to track throughout the system includes:

- Users' roles (e.g. stage manager, lighting designer, etc.)
- Station type (wired base station, wireless transmitter, belt pack, speaker station, etc.)
- Accessory type (headset, handset, etc.)
- Unit number or letter scheme
- Channel assignment information
- Location
- Paging/stage announce

Intercom systems may be documented in a number of formats, including:

- System Block Diagram
- Hookups
- Routing
- Rack Elevations
- Worksheets

The following are 3 examples:

Wireless Channels			Groups	**Wired Vcom**		Groups
1-control	Automation	3 packs	AE	Automation	FOH	AE
	PD	1 pack	E (F)		SL	AE
	PSM	1 pack	E (F)		SR	AE
2-driving dinos	Momma Steg	2 packs	DE		Grid	AE
	Trisceratops	2 packs	DE	Pyro	FOH HR	AE
	T-Rex Spotter	1 pack	DE	Lights	FOH HL	BE
3-stage	TD	1 pack	AE (F)	Sound	FOH HL	CE
	Carpenter	1 pack	AD	Sound BS	BSR	CE
4-dinoteers	Blue	1 pack	D (Show)	Trex Driver	FOH HR	DE
	Jeanie	1 pack	D (Show)	Calling SM	FOH HL	ABCDE
	Baby Steg	1 pack	D (Show)	PSM Office	BSL	ABCDE
	Dinos	3 packs	D (Show)	TD Office	BSL	ABCDE
1 Spare				3 Spare		

Total	**RAD**	**18**	**Vcom**	**15**

A	**Automation**	
B	**Lights**	
C	**Sound**	
D	**Dino**	
E	**ALL/SHOW**	***Force Through***
F	**Stage Announce Vcom to Backstage PA**	

Limitation is 2 Volume knobs on RAD Packs
Can't have more than 2 group Ch on RAD Packs
Channel 3 on RAD packs will be wireless talk around

RAD UV-1G	Channels	**Department**				Volume knobs	# of Packs
Base Station #1	4 Ch	**Control**	Automation 1,2,3			A E	3
Base Station #2	4 Ch	All Stop peeps	PD, PSM, TD, Carpenter			A E (Stage Anc)	4
Base Station #3	4 Ch	Driving Dino #1	Momma Steg 1&2, Tricer1&2,			D E	4
Base Station #4	6 CH	Dinoteers	Blue, Jeanie, Baby Steg, Dino 1, Dino 2, Dino 3			D (Aux in Show)	6
Base Station #5	4 CH	Driving Dino #2	Trex Spot &			D E	1

Figure 8.1.1 Example production intercom schedule

Channel Breakdown

Com Channels:	Stage	Video:	FOH Color
	LX / Video		FOH IR
	Spots		SL TBD
	Sound		SR TBD
	Stage Private		
	LX Private		
	Video Private		
	Spot Private		
	Sound Private		

Show Com

Staff	Name	Location	Com Unit	Headset	Channels	Video	Shots	Notes
Stage Manager	Kat	TBD	4-Channel	Headset	A - Stage	x1 15" Video	FOH Color	Manual Switch inline
					B - LX / Video	x1 7" Video	FOH IR	for 17" monitor
					C - Spots	x1 7" Video	SL TBD	
					D - Sound		SR TBD	
House Lights			1-Channel	Headset	A - LX/Video			
Down SL		SL Door	1-Channel	Headset	A - Stage	15" Video	FOH Color	L
						7" Delvcam	FOH IR	
Down SR		SR Door	1-Channel	Headset	A - Stage	15" Video	FOH Color	
						7" Delvcam	FOH IR	
Upstage Center		Upstage Door	1-Channel	Headset	A - Stage	7" Delvcam	FOH IR	
LX Op		Spot Booth	4-Channel	Headset	A - LX / Video	x1 15" Video	FOH Color	If needed
					B - LX Private			
					C - Spots			
					D - Spots Pvt			
Sound Op	Todd	FOH	2-Channel	Headset	A - Sound			
					B - Sound Private			
Sound A2		A2 Land	2-Channel	Headset	A - Sound			
					B - Sound Private			
Spot SL		Spot SL	2-Channel w/Prg	Headset	A - LX / Video			
					B - Spot Private			
Spot SR		Spot SR	2-Channel w/Prg	Headset	A - LX / Video			
					B - Spot Private			
SM Office		SM Office	2-Channel	Handset	A - Stage	7" Dual Mounted	FOH Color	
					B - Stage Private		FOH IR	
RF Wireless A	#1 - ASM #1			Headset	A - Stage			
	#2 - ASM #2			Headset	B - Stage Private			
	#3 - Prop #1			Headset				
	#4 - Prop #2			Headset				
RF Wireless B	#1 - Fly Guy			Headset	A - Stage			
	#2 - Deck LX?			Headset	B - LX / Video			
	#3			Headset				
	#4			Headset				

Figure 8.1.2 Example intercom & CCTV worksheet

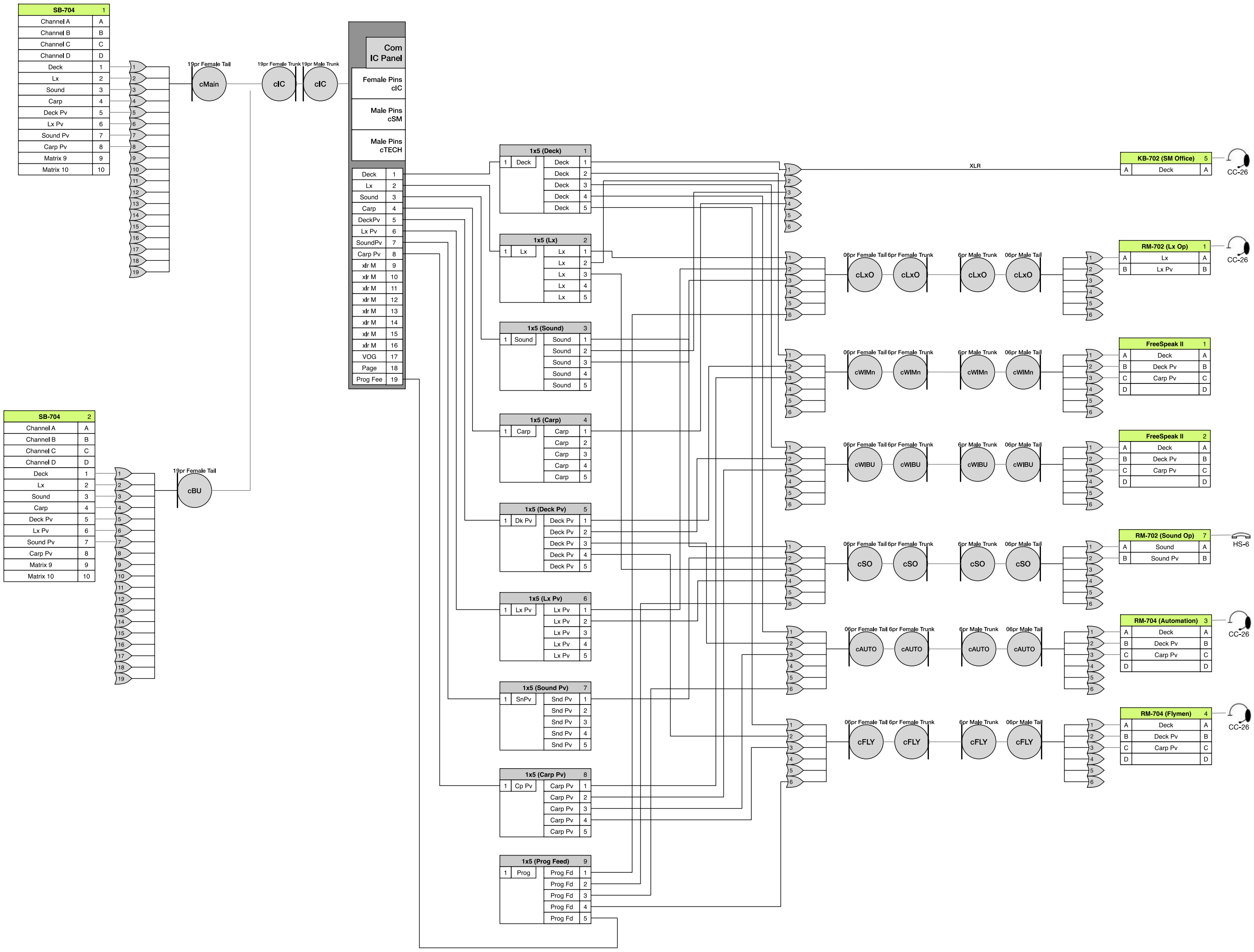


Figure 8.1.3 Example production intercom SBD

8.2) CCTV

Sometimes it is necessary to provide documentation relating to production video monitor routing and hookup. It is beyond the scope of this document to go into detail on video systems and their uses, however, the same guidelines laid out in this document should be followed to provide clear, concise drawings and schedules.

9. Power

Sometimes it is necessary to provide documentation relating to power routing and hookup, particularly in systems using three-phase power sources and power distro that is not built-in to the venue. It is beyond the scope of this document to go into detail on power, however, the same guidelines laid out in this document should be followed to provide clear, concise drawings and schedules.

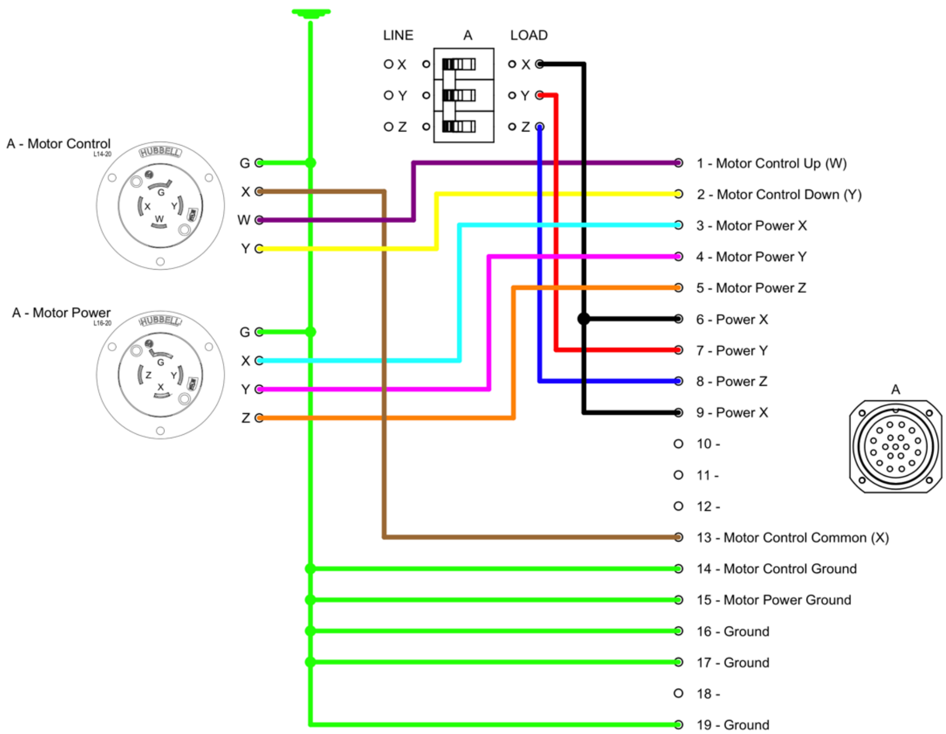


Figure 9.1 Example production power SBD
Custom 19-pin Socapex for chain motor power and control
Cables color-coded to match physical wiring

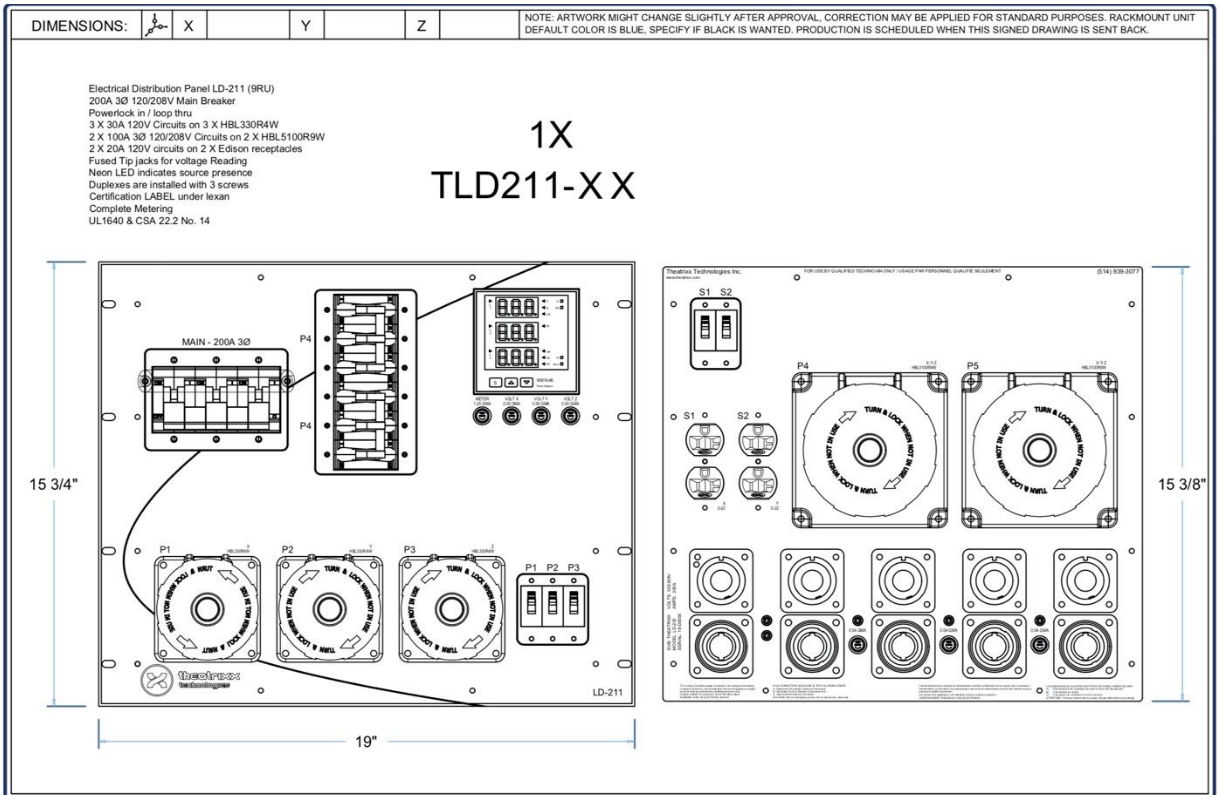


Figure 9.2 Example production power panel drawing

10. Cable Labeling

It is recommended that both ends of every cable in the sound system and all sound-adjacent systems (intercom, CCTV, etc.) be labeled clearly. While not always thought of as part of the documentation of a sound system, cable labels are one of the parts of the system documentation that ends up being physically part of the production. On Broadway and in most theatrical applications, creating the cable labels is the responsibility of the design team. In many corporate or installation projects, the labels are created by the technical or installation team.

Cable labeling serves many purposes. Among them:

- Ensuring that all necessary cable is included in a rental package.
- Ensuring that every signal reaches its intended destination during installation.
- Aiding in troubleshooting of system issues.

It is important to remember that the execution of an audio installation is rarely completed by the person who created the documentation, and frequently executed (at least in part) by technicians and stagehands who are not full-time audio engineers, and who may not be audio crew at all. This may mean that the person creating the cable paperwork is translating between designer nomenclature and stagehand execution. Cables should be labeled and named in a manner most useful to the technicians who will be installing them.

There are many different methods and techniques of naming and physically labeling cables. For example, Broadway techniques are different from installation or corporate methods. None of these is incorrect; it is simply a matter of choosing the method which most efficiently executes the cabling task you have at hand. Some things to keep in mind while setting up your cable labeling technique:

- Make the nomenclature system simple and easily discernible.
- If the use of the cable is not immediately clear with a quick investigation of the label, make sure to include a list or key that outlines any additional information required for installation.
- Make sure the technique used to physically affix the label to the cable is in accordance with standards readily available and approved by the cable's owner (e.g. paint pen on gaffer's tape, electrical tape with Avery label, P-Touch tape, or Brady label).
- Take into account the required lifespan of the label when choosing a physical labeling method. A one-day corporate event does not require a permanent or durable label in the way a tour or installation does.

11. Equipment Schedules

Schedules in production paperwork are lists of equipment grouped by type (we are not referring to actual production timeline or call schedules here). Schedules are often produced in order to have one document that identifies every piece of equipment in a single category. The following types of equipment often have schedules associated with them (though this is not a comprehensive list, and designers or engineers will often create whatever schedules will be useful to them on a given production):

- Cable schedule: a document that lists all anticipated cables to be used in a production, with details about gauge, termination type, etc.
- Amp schedule: a document listing all power amplifiers with details about which racks and locations they will be mounted in, basic specs, etc.
- Computer schedule: a document listing all computers used in a production, and what software/licenses and other features they must have
- FOH schedules: a document listing all the gear that will be installed at Front of House, as a means of organizing gear going to the same location in a venue
- Etc.

In Figure 11.1, we see a sample detail from a cable schedule:

Source Location:	Source Device:	Source J-Box #:	Destination Location:	Destination Device:	Destination J-Box #:	Cable Type:	QTY:	Cable Type Length Tolerance (Max Feet):
Backstage Left AVC Rack #1	Managed Switch #1	n/a	Backstage Left AVC Rack #1	QSC Q-Sys Core 1100	n/a	Cat6 w/RJ45 termination	2	295
Backstage Left AVC Rack #1	Managed Switch #1	n/a	Backstage Left AVC Rack #1	QSC Q-Sys IO8 Frame	n/a	Cat6 w/RJ45 termination	2	295
Backstage Left AVC Rack #1	Managed Switch #1	n/a	Backstage Left AVC Rack #1	QSC TSC-8 Touch Panel	n/a	Cat6 w/RJ45 termination	2	295
Backstage Left AVC Rack #1	Managed Switch #1	n/a	Backstage Left AVC Rack #1	TRIPP-LITE SU2200RTXLCD2U Uninterruptible Power Supplies (2x units)	n/a	Cat6 w/RJ45 termination	2	295
Backstage Left AVC Rack #1	Managed Switch #1	n/a	Backstage Left AVC Rack #1	Dell R7610 Rack PC	n/a	Cat6 w/RJ45 termination	2	295
Backstage Left AVC Rack #1	Managed Switch #1	n/a	Backstage Left AVC Rack #1	AMX NI-700	n/a	Cat6 w/RJ45 termination	1	295
Backstage Left AVC Rack #1	Managed Switch #1	n/a	Backstage Left AVC Rack #1	EXXACT MPXTBD Video Server	n/a	Cat6 w/RJ45 termination	2	295
Backstage Left AVC Rack #1	Managed Switch #1	n/a	Backstage Left AVC Rack #1	GEFEN PRO HDFST-MOD-16416-HDELR matrix/extender	n/a	Cat6 w/RJ45 termination	1	295
Backstage Left AVC Rack #1	Managed Switch #1	n/a	Backstage Left AVC Rack #1	Managed Switch #2	n/a	Cat6 w/RJ45 termination	6	295
Backstage Left AVC Rack #1	Dell R7610 Rack PC	n/a	Backstage Left AVC Rack #1	DELL DKMMLED185-G01	n/a	VGA	1	16.4
Backstage Left AVC Rack #1	Dell R7610 Rack PC	n/a	Backstage Left AVC Rack #1	DELL DKMMLED185-G01	n/a	USB 3.0	2	9.8
Backstage Left AVC Rack #1	EXXACT MPXTBD Video Server	n/a	Backstage Left AVC Rack #1	GEFEN PRO EXT-DVI-1CAT6S DVI to Cat6 converter/extender (2x units)	n/a	Mini Displayport to DVI adapter, DVI cable	2	15
Backstage Left AVC Rack #1	EXXACT MPXTBD Video Server	n/a	Backstage Left AVC Rack #1	GEFEN PRO HDFST-MOD-16416-HDELR HDMI to Cat6 16x16 converter/extender	n/a	Mini Displayport to HDMI adapter, HDMI cable	9	45

Figure 11.1.1: Sample cable schedule (detail)