Sound Graphics Recommended Practice
A Project of the USITT Sound Commission
October 1, 2008

This document presents a Recommended Practice for Sound Graphics which can be used by sound designers and system engineers to communicate the sound system to be installed for a theatrical production or event. The guidelines are not intended to be a comprehensive directory of audio and electronic symbols. Instead, it proposes a flexible framework of symbols and graphic tools for practical communication.

The information which a sound designer or system engineer must communicate to others takes several forms. Principal among these are system diagrams, also called schematics, scale drawings of equipment placement and rigging, and spreadsheets or databases of equipment or cable. This document focuses on the system diagrams which illustrate how the equipment to be used is connected. Scale drawings should follow the USITT Scenery Graphic Standard for plans, sections and elevations. Equipment lists and cable orders are straightforward non−graphic information which is outside the scope of this document.

System Diagrams
Audio, video and control system diagrams all follow the same basic framework. The diagrams are drawings, not to scale, which show the devices included in a system and how they are to be connected. The diagrams are not pictorial elevations and use only a few visual clues to indicate equipment type. More typically, devices and their inputs and outputs are simply labeled.

Diagrams generally read from inputs on the left to outputs on the rights for each device and for the system as a whole. Complex systems may require many drawings to show all system connections. The layout of the diagrams and where to break connections across pages should be carefully considered to maintain maximum intelligibility of the design. For less complex systems, audio, video and control can be shown within the same diagram. However, for more complex systems the various signal types can be shown in separate diagrams.

Text should always be used at a legible size, usually no less than 3/32". Drawings should be created in standard ANSI sizes for ease of printing and duplication. Line weights, borders and title blocks should conform to the USITT Scenery Graphic Standard.

Device Blocks

The basic diagram component is the Device Block, see figures 1a and 1b. The device block has two forms. Figure 1a shows a device block with a rectangular bottom which indicates that this device is only shown once in the diagrams. Figure 1b shows a device block whose bottom is a break line. The break line indicates that this device is also shown elsewhere in the diagrams. The other location or locations of the device block can be listed below the break line. A curved line is an acceptable alternate for the break line.
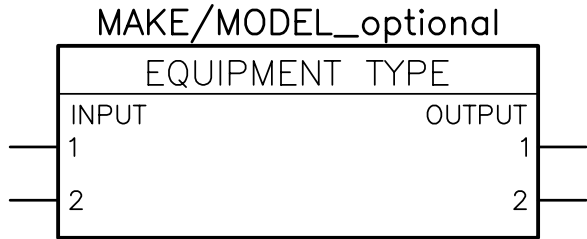
MAKE/MODEL_optional

EQUIPMENT TYPE	
INPUT	OUTPUT
1	1
2	2

Figure 1a— Single Occurance Device Block

MAKE/MODEL_optional

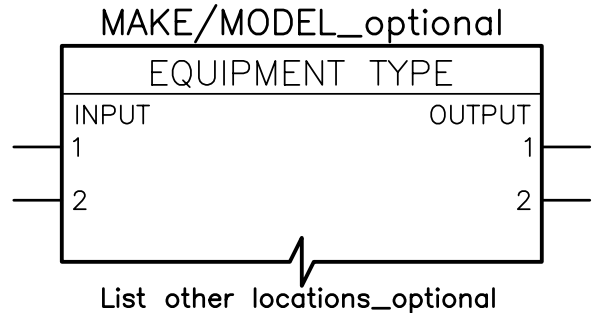| EQUIPMENT TYPE	
INPUT	OUTPUT
1	1
2	2

List other locations_optional

Figure 1b— Multiple Occurance Device Block

Device Blocks also include information about the type of device indicated and the inputs and outputs being used, see figure 2. For devices with many input and output options, only those being used should be shown. Optional information includes the make and model of the device. The device box can be expanded in height to accommodate the connections of the device.
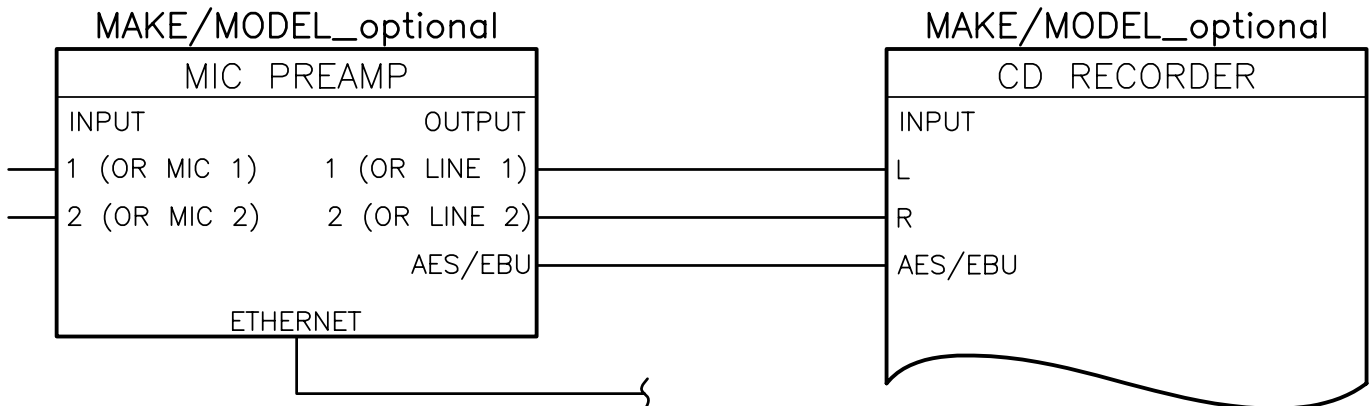
MAKE/MODEL_optional

MIC PREAMP	
INPUT	OUTPUT
1 (OR MIC 1)	1 (OR LINE 1)
2 (OR MIC 2)	2 (OR LINE 2)
	AES/EBU
ETHERNET	

MAKE/MODEL_optional

CD RECORDER
INPUT
L
R
AES/EBU

Figure 2— Two Device Blocks Connected

Device Block Connections

Devices are connected with lines between input and output. Inputs and outputs should be labeled simply. When known, use the exact labeling of the device, ex. 1–2 or left–right. In Figure 2 the mic inputs and line outputs can be simply numbered since the input and output signal type can be assumed due to the type of device. The AES/EBU output is labeled by signal type because it is not typical.

Bi–directional control or communications connections may be shown attached to the bottom, left or right of the device block as best serves clarity. For complex systems these connections can be shown on separate drawings.

Connector and Cable Labels

For clarity, connector and cable types can be labeled, see Figure 3. Often this is not necessary due to common usage and only connectors or configurations which might cause confusion should be labeled. Connectors should be labeled on the left side of the cable line only when both ends use the same connector. Cable types can be labeled near the middle of the cable line. Cable should not be labeled if it conforms to the system's generally used cable. Typical cables for the project can be listed in a note on the drawing or in a separate schedule.
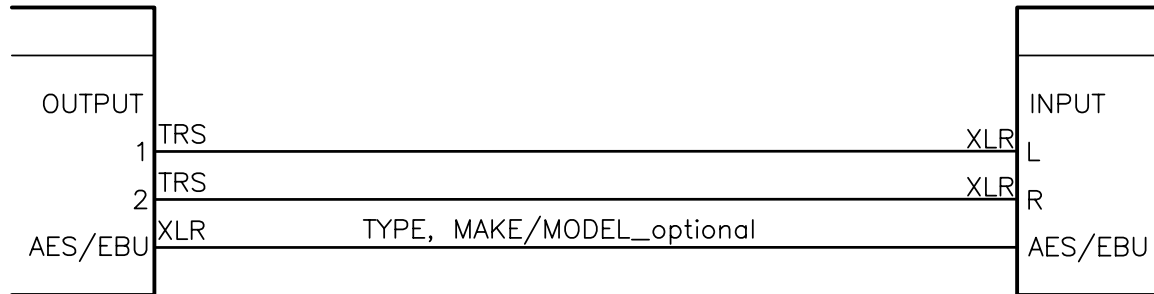
Figure 3— Connector and Cable Labels

Connection Grouping

Some devices, such as mixers, have a large number of connections. For these devices and for patchbays, connections greater than three of one type may be grouped as shown in Figure 4. Also, note that a label like "MIC INPUTS" may be created to avoid multiple occurrences of the word "MIC" at each input.
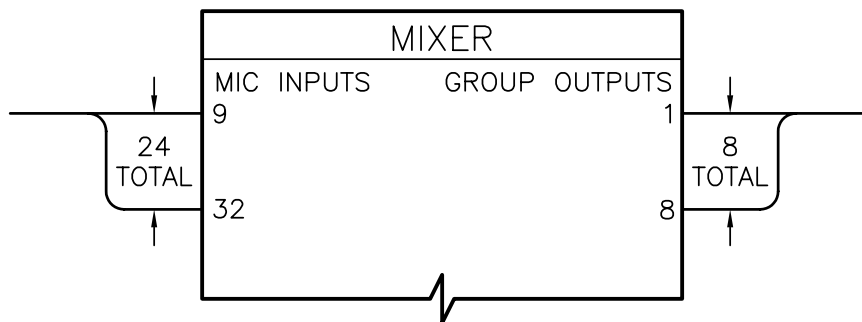
Figure 4— Connection Grouping

Patchbays

Patchbays are passive devices which do not require as much graphic space as many other devices. They can be drawn as shown in Figure 5 (on page 4). Patchbays should be labeled according to signal type and may use the multiple occurrence convention with the break line on the bottom. Patchbay drawings should indicate whether the signal is not—normalled, half—normalled or full—normalled as shown. A form of full—normals, sleeve normals, are included for mic patchbays to avoid errant phantom power paths.

Loudspeaker, video, network and optical fiber patchbays can all be shown in the same manner as the line and mic patchbay examples.
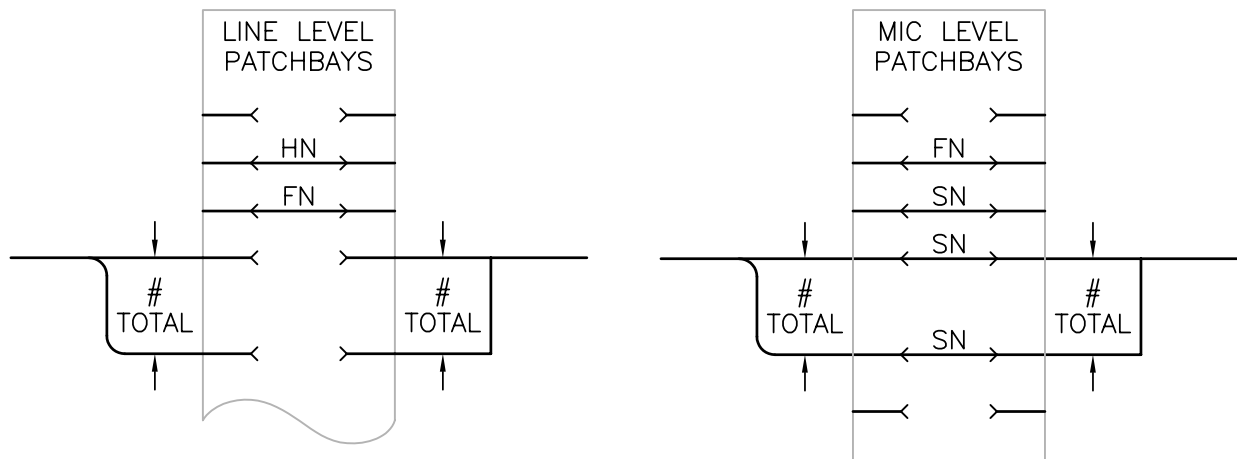
Figure 5— Patchbay Connections

In the mic patchbay diagram shown above the input side patchpoints are shown with curved corners and the output side is shown with sharp corners. This difference indicates that the input cable is a multi—signal cable and the output cables are a group of individual cables. In some contexts this difference will not be significant, such as inside a rack, but at other times the difference is significant, such as the connection to a stage box or remote rack where a "mult" is highly desirable. "Mults" can also be labeled as such to avoid confusion.

No—normal, full—normal, half—normal and sleeve—normal are all identified on the patchbay diagrams. Usually patches made by patch cables are best shown in a table or spreadsheet rather than graphically. The table or spreadsheet can be imbedded in the drawing or a separate document. Communicating patches in this way allows for easier updating and less confusing diagrams.
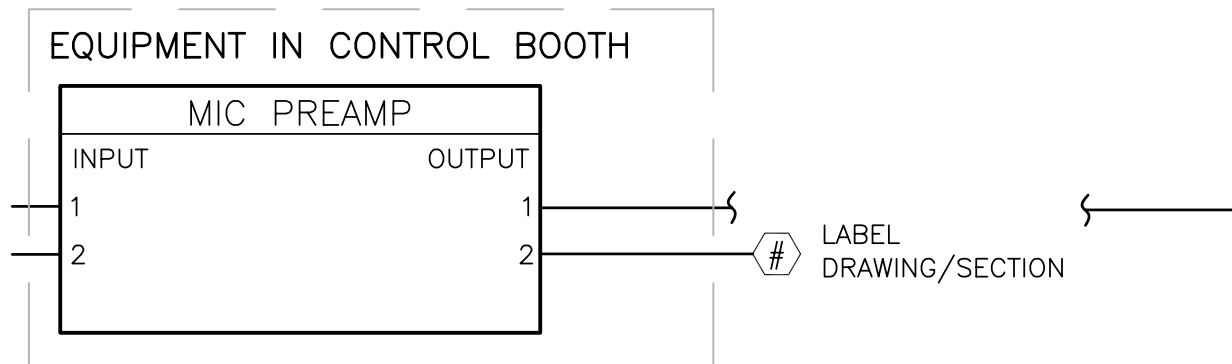

Figure 6— Other Connection Conventions

Other Connection Conventions
In Figure 6, a dashed box is used with a label to identify the location of the device. The box should be used to indicate when equipment is located at some distance from other devices. This information can be critical to a system installation and would otherwise be absent from the diagrams. Output 1 has a break—line, which may be used to avoid drawing lines through devices in order to maintain the clarity of the drawing. The line should only break over a short distance and the other side should be clearly visible as a continuation of the broken line. If the preceding conditions can not be met then it is better to use a fly—off with a label. It is not necessary to break every line which crosses another. The break—line is used when needed for clarity. Output 2 in Figure 6 shows a fly—off. A fly—off is used when a connection is made to another section of a diagram or another drawing. The fly—off can also be used when a connection would travel back towards the left side of the drawing, which would make reading the drawing more difficult. The fly—off should be given a unique letter or number designation and a label describing where to find the other side of the fly—off.

Cable Conventions

Figure 7 shows other useful cable conventions. A "two-fer" or conductor to conductor splice is shown with a circle for a clear indication that it is not just a separate cable branching off. Also, the length of a cable can be shown. This is often important to define, especially for stage boxes and connections from a mixer to an associated rack or stage box. This information can also be conveyed in a cable order, in which case the cable would be given a unique code for reference to the cable order.
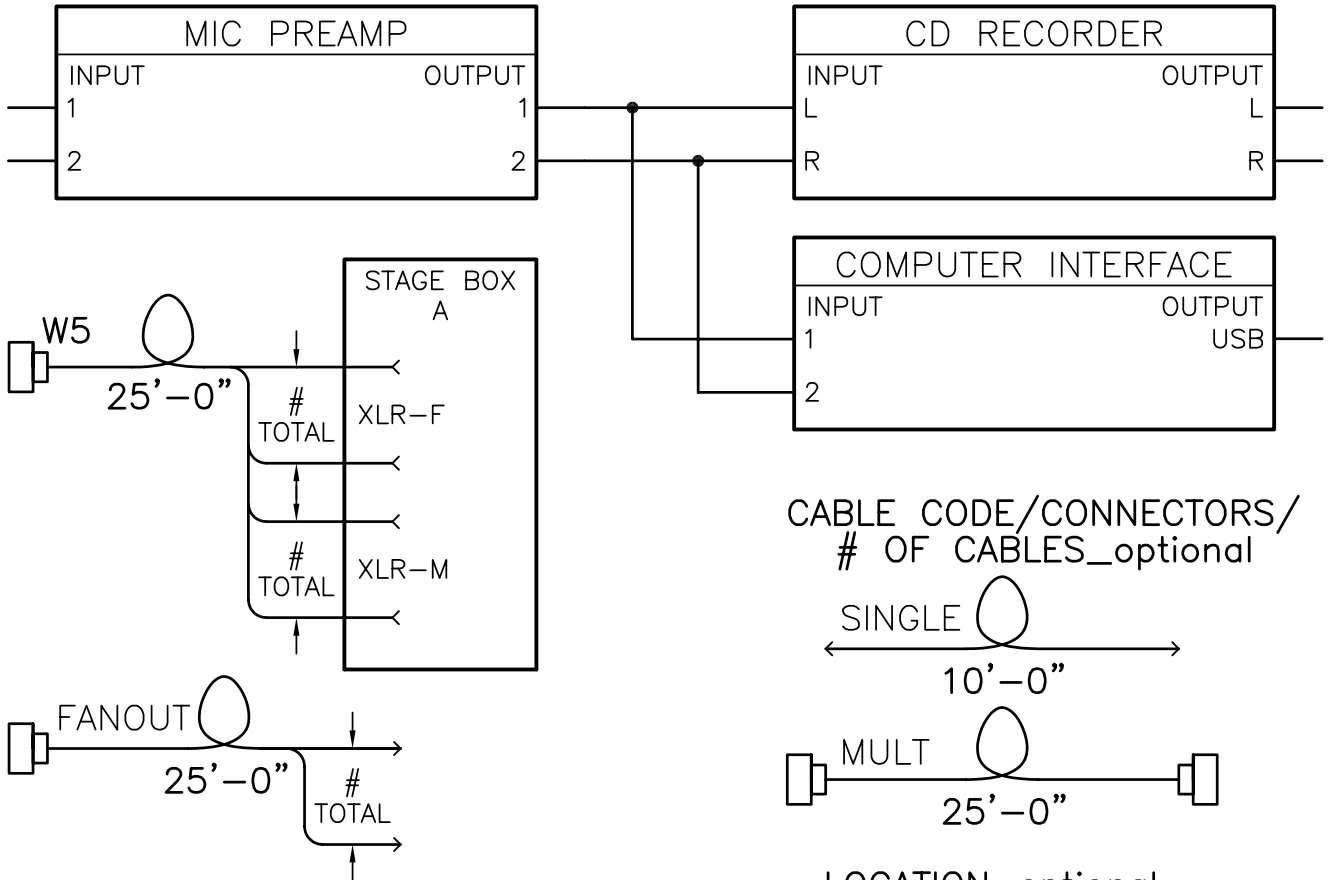
Figure 7— Other Cable Conventions

AV Panel Connections

Figure 8 shows the connections at an AV panel. In some systems, devices are interfaced to installed infrastructure, Only connections which will be used need to be shown. The connectors are indicated by a sideways "V", similar to the patchbay symbol. Connector types can be labeled on the panel. This panel shows a multi-pin connector whose symbol distinguishes it from a single cable connection. Connection panels can be found in racks as well as wall-mounted panels.
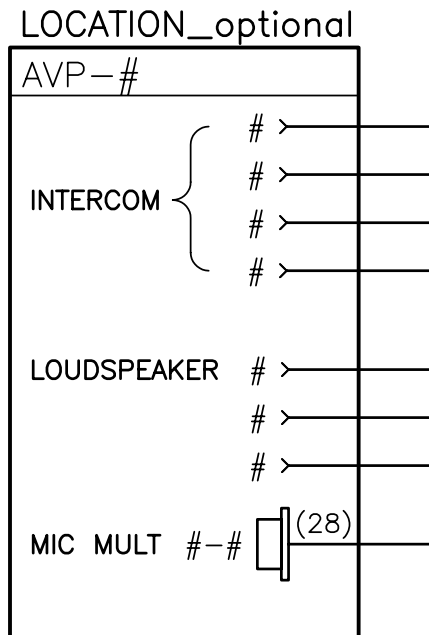
Figure 8— AV Panel Connections

Amplifier Symbols

Figure 9 shows special symbols for amplifiers. The symbol on the upper left is a two-channel amplifier. Both channels are shown in the same device block for clarity. Amplifier blocks can also use a break-line at the bottom to indicate that it is shown in multiple locations. Expanded blocks can be created for four and eight-channel amplifiers. The symbol below the two-channel amplifier is a parallel-output amp. Below that one is a bridged amplifier, in which the power from two channels is used to produce one output. The blocks can also be expanded to include monitoring and control connections as required. Amplifier channels using 70V or other output voltages, rather than low impedance, should be clearly labeled.
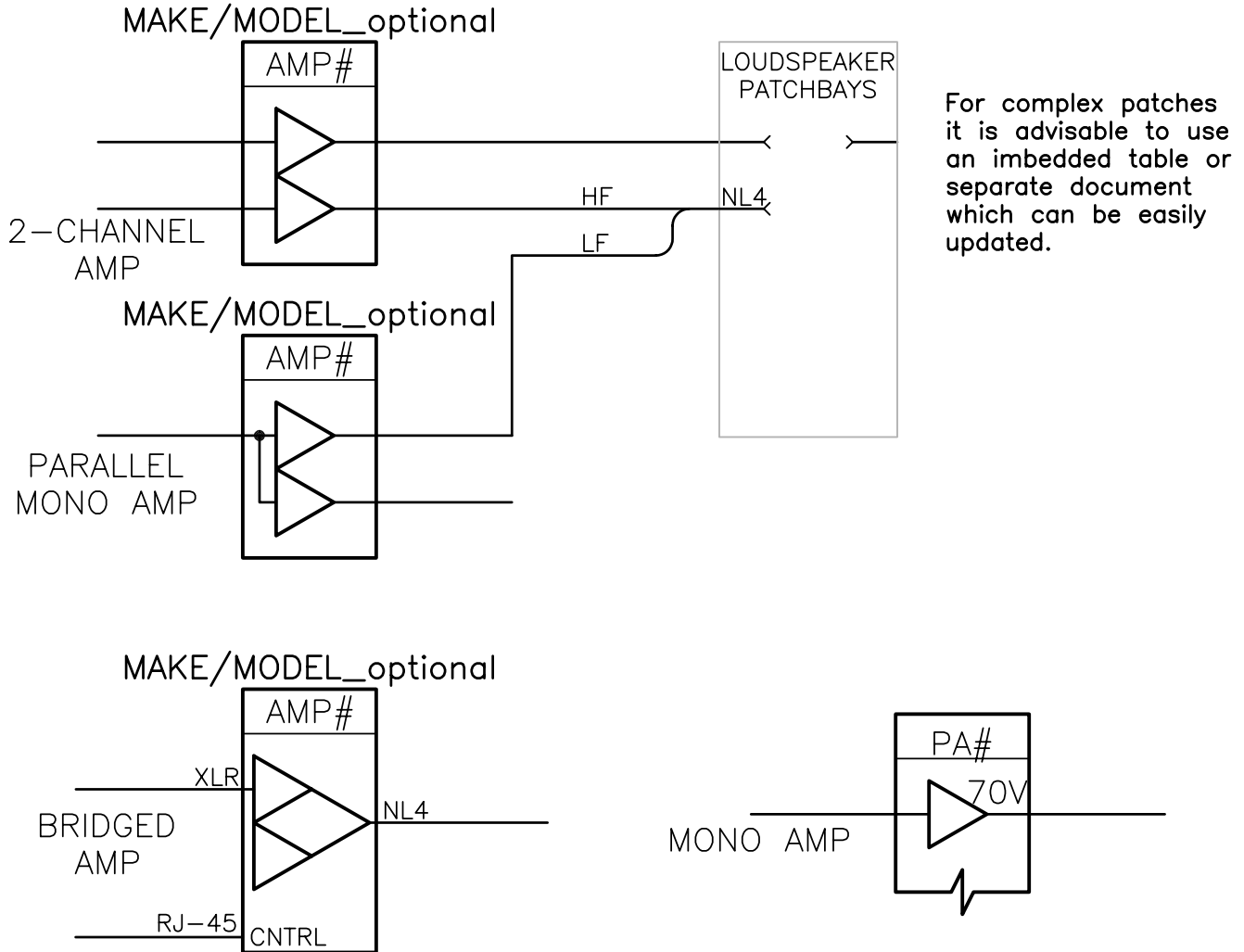

MAKE/MODEL_optional

AMP#

2-CHANNEL AMP

LOUDSPEAKER PATCHBAYS

HF

LF

NL4

For complex patches it is advisable to use an imbedded table or separate document which can be easily updated.

MAKE/MODEL_optional

AMP#

PARALLEL MONO AMP

MAKE/MODEL_optional

AMP#

XLR

BRIDGED AMP

NL4

RJ-45   CNTRL

PA#

70V

MONO AMP

Figure 9— Amplifier Symbols

Loudspeaker Symbols

Figure 10 shows special symbols for loudspeakers. Loudspeakers are among the most complex devices to depict because there are a great diversity of configurations. The goal should be a clear explanation of the connection of the loudspeakers, rather than internal driver configuration. A two-way loudspeaker with an internal crossover can be shown with a single driver symbol. Notes may be required to clearly explain the signal connections.
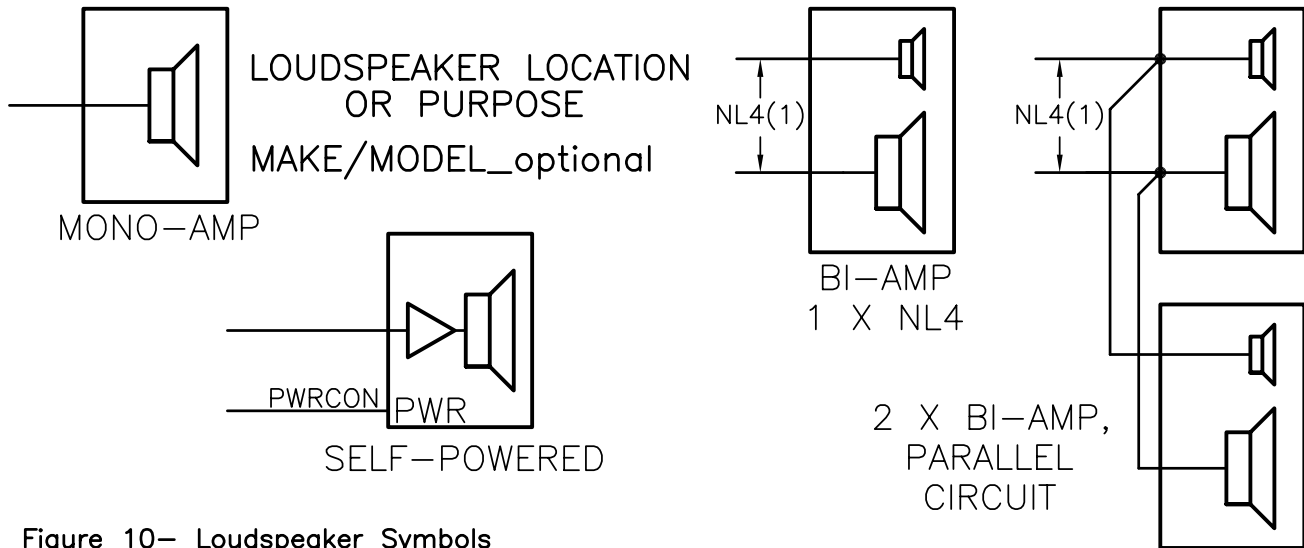
LOUDSPEAKER LOCATION OR PURPOSE

MAKE/MODEL_optional

MONO-AMP

PWRCON PWR

SELF-POWERED

NL4(1)

BI-AMP
1 X NL4

NL4(1)

2 X BI-AMP,
PARALLEL
CIRCUIT

Figure 10- Loudspeaker Symbols

Microphone Symbols

Figure 11 shows a special symbol for microphones and a method for depicting wireless microphones and their antennas.
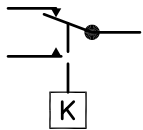
LOCATION AND
MAKE/MODEL
_optional

(#)

MAKE/MODEL_optional

TRANSMITTER

MAKE/MODEL_optional

RECEIVER

OUTPUT

FREQUENCY
_optional

MAKE/MODEL_optional

(#)

ANTENNAS
MOUNTED ON
MIC STANDS
AT MIX
POSITION

RECEIVER

OUTPUT

A
ANTENNA
B

ANTENNA TYPE
_optional

Note: Antennas and antenna networks may also be shown. Alternately, the type and quantity of antennas can be noted.
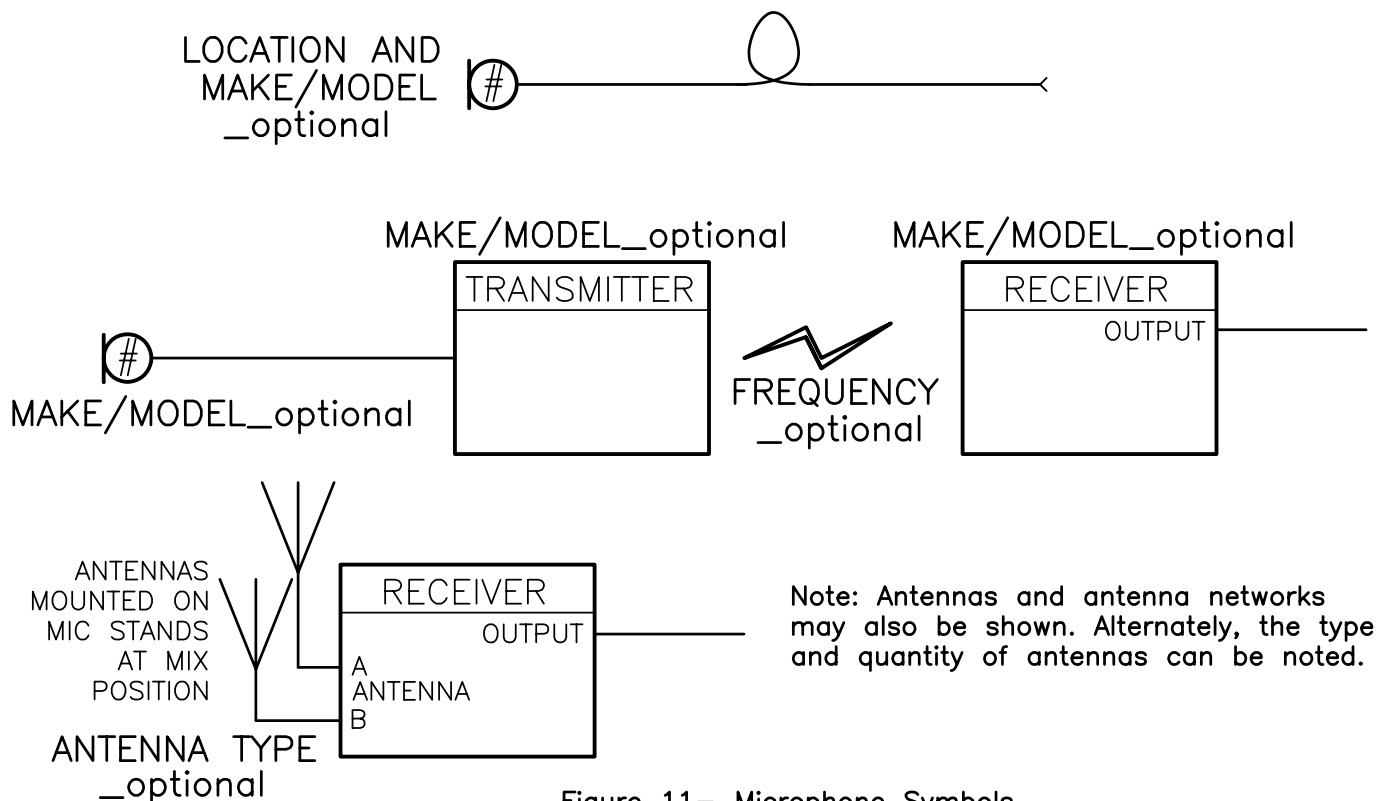
Figure 11- Microphone Symbols

Circuit Diagrams

Figure 12 shows circuit diagram symbols and some same circuit diagrams. All of the previous figures for system diagrams have been "one—line" or "block" diagrams in which cables are indicated by single lines rather than individual conductors being shown by single lines. However, some system details have to be shown as "circuit" or "schematic" diagrams in which the individual conductors are shown. Circuit diagram sections within a larger block diagram should be clearly labeled as such to avoid confusion. A large library of circuit diagram symbols is available in ANSI/IEEE Standard 315/1975 and 315A/1986. The inclusion of a full set of these symbols is beyond the range of this standard and is not needed by most theatrical sound designers and system engineers.
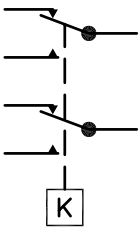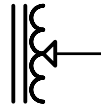

Single—Pole, Single Throw Relay (SPST)
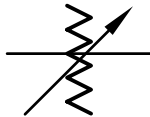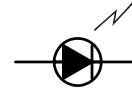
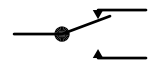Double—Pole, Double Throw Relay (DPDT)

Potentiometer

LED

Transformer

Auto—Transformer

Diode

Switch (SPST)

VOLUME CONTROL WITH PAGE OVERRIDE RELAY

10W
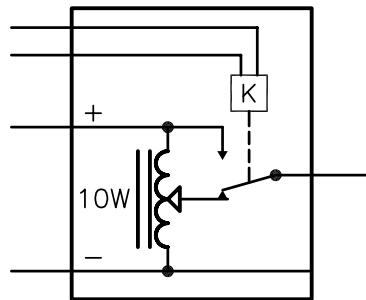
70V MONITOR/PAGE LOUDSPEAKER

3.75W

DRESSING ROOM B224

5 TOTAL

LOGIC CONTROLLED RELAY

INPUT

N.C.

N.O.

LOGIC

K

PWR

PWR SUPPLY
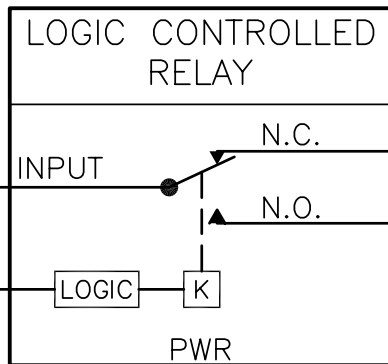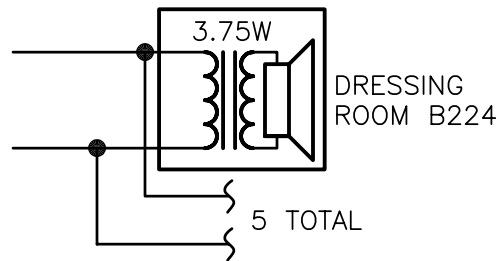
Note: The abbreviation "N.C." means normally closed and "N.O." means normally open. This refers to the normal or unenergized status of a connection. The opposite condition occurs when the circuit is energized. Many devices can be wired in either normal mode.

Figure 12— Circuit Diagram Symbols and Sample Circuits