# J.E.I Custom Audio Equipment
# Design Request Worksheet

A little information first along with some examples of J.E.I. equipment.

Basic types of audio equipment:

Line Amplifiers - where you have one "line level" input going to an amplifier driving one "line
level" output.  Called a "buffer amp" if the input and output levels  are the same.

Microphone Amplifiers – one to one like Line amplifiers except much more gain because
microphones generate very small signals.

Distribution Amplifiers – one input to an amplifier that drives more than one output, usually "line
level" in and out.  Gain options are unity with no controls and variable with just an input
control or with output level controls also.

Mixers / Summing Amplifiers  - two or more inputs that are mixed or "summed" together to a
single output.  Used for monitoring more than one channel at a time, mixing signals from
more than one source or microphone.  Gain options are unity gain mixing, variable gain
on the output, or variable gain on each input.

Input and output characteristics are important.  Line level and headphone outputs are common
circuits.  Microphone inputs with very small signals and high power speaker outputs with large
signals require more gain.  Input sources like telephone circuits require special  consideration as
do any that have the signal combined with a voltage or other signals.

There are two basic signal connection methods,  unbalanced and balanced.  Both are two wire
connections.  Unbalanced is like your home stereo with RCA connectors.  The outer contact is
at signal ground and the center contact carries the signal.  Everything that connects this way
has a common ground thru the cables.  Balanced connections are seldom used in the home but
almost always used in professional and industrial audio.  Balanced connections (when done
properly) 'reject' a lot of noise in the environment like 60 cycle hum and noise from fluorescent
lamps.  Balanced lines are defined as having equal  impedances from both leads to 'ground'.
Adding a shield to a twisted pair can improve noise rejection but the signals are still carried only
on the two inner wires.  It does  Not become a three wire signal connection.

There are also direct coupled and transformer isolated connections.  Both methods can be used
for balanced and unbalanced connections.  Direct coupled inputs and outputs however have a
path to ground that limits the amount of difference in 'ground' voltage between the source and
destination.  Transformer outputs are limited by the breakdown voltage between the  windings
which is often 1000's of volts.  Transformer coupling has often been used to create "balanced
outputs".  Note that if you take such an output and connect it to an unbalanced input, it becomes
an unbalanced line because one side is now connected to ground and the  impedances to
ground are no longer equal.

Two other important characteristics are bandwidth and dynamic range.  Bandwidth is the range
of frequencies you're interested in hearing / reproducing.  Dynamic range is the range in the
signal level you're interested in.  Signal to noise is the range from the 'normal' level down to the
noise level.  Sometimes more important is the range from normal to the highest level signal that
can be handled.  This is the maximum input level at the input and is called 'headroom' at the
output.  Signals above these levels cause distortion that makes it hard to understand what's
being said and is unpleasant to listen to.  Can be tiring in a monitoring situation where an
operator has to continuously listen to a channel with significant distortion.

Switching controls can be added to all of these.  Line amps can have "mute switches", Distribution Amplifiers can have switches to select which outputs are active, and mixers can have switches to select which inputs are active.  The J.E.I. AP-109 is an example of a dual channel mixer with electronic switching (and remote control) to select which inputs are active for monitoring.  The AP-8 combines 8 line amplifiers with an 8-channel selector switch to monitor any one of the channels.  Both of these units also contain headphone/speaker amplifiers with level controls.

Another option is "Audio Processing" such as  automatic level control (ALC) to keep the output level fairly constant.  This function is included on J.E.I. recorders and the J.E.I. LA-24 is a 24-channel leveling amplifier.  Voice activated switches (VOX) "noise gates" are available to turn channels on only when there is a valid signal at an input.  The logic output from the VOX section can be used to activate external devices like recorders.  Note that all J.E.I. recorders have VOX circuits and functions built in.  Filters can be used to limit the bandwidth of signals to only the range of interest.  In conjunction with VOX circuits or tone decoders they can be used for control and switching purposes.  The J.E.I. AD-1 Audio Discriminator combines special filters, a VOX circuit, and electronic switch to provide a voice operated switch in the presence of continuous tones and noise.

The type of connectors used should also be specified such as modular connectors for phone interfaces, 3.5 mm for recent consumer and PC audio, ¼ inch 'phone' for older audio along with RCA 'phono' types.  Screw terminals are often used for "installed sound" because it is difficult to run cables thru conduit with connectors attached to them.

Special control circuits and functions can also be provided.  The J.E.I. RTC-100T includes a telephone line voltage sensing circuit to detect when the telephone handset is "offhook".  The J.E.I. TC-3 includes an optical proximity sensor to sense when the telephone handset is in the cradle.

The Worksheet:

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|---|---|
| Contact Name | |
| Telephone number | |
| Address | |
| Address2 | |
| City/State/ZIP or Postal Code | |
| Country | |

Fill in the appropriate entries.  Leave empty any you don't care about or aren't sure about.  Call with any questions.  The questions about the common name and application are so we know where to look for further information for your product and so we will know what standards to use or suggest.

| | |
|---|---|
| Common name for this equipment (mixer, mic preamp, etc..) | |
| Common application or industry | |
| Number of inputs (sources) | |
| Input level(s) | |
| Connector type(s) | |
| Number of outputs (destinations) | |
| Output level(s) | |
| Connector type(s) | |
| Input / Output relationship (1 to 1, 1 to many, many to 1?) | |
| Control functions | |
| Other requirements | |
| Notes: | |