

## Power Amplifiers – Basic Notes and Information

There are many different types and configurations of amplifiers available from other manufacturers. In my experience, I have used 4-Channel and 8-Channel Amplifiers, Dual Channel (Stereo), High-Powered Amplifiers (over 4000 - 8000 watts per channel), 70-Volt, Mixer / Amplifier Combo's, Car Amplifiers, and Single Rack Space Amplifiers. The main thing I have learned over the years is that there are “cheap” models and “high-end” models of amplifiers. Cheaper models may or may not work for what you need, and higher-quality amplifiers will give you the best quality (and are very reliable). Which amplifier do you need? It Depends! Having a basic knowledge of power amplifiers will definitely help with the decision-making process.

### Dual Channel Amplifiers

These are the most popular type of amplifiers used in Live Performances and Permanently Installed Theater Sound Systems. This type of Amplifier has 2-Channels with equal output power. The Amplifier can be used as two separate amplifiers (Stereo), or you can Bridge the Amplifier and use it as one “Mono” amplifier. Also referred to as “Stereo” Amplifiers. QSC Model# PL-380 PowerLight 3 Series Amplifier (Shown Right). [Video Clip!](#)



Courtesy of QSC

### 70-Volt Amplifiers

70-Volt Amplifiers have built-in 70-Volt Transformers that provide power to “Constant Voltage Speaker Systems.” 70-Volt amplifiers can power multiple 70-Volt speakers over very long distances. The QSC Model# CX-602V 70-Volt Amplifier (shown left) has a power rating of 600W per channel at 70-Volts and 550W per channel at 8-ohms. 70-Volt Systems are covered in more detail on our Technical eBook.



Courtesy of QSC



### Multi-Channel Amplifiers

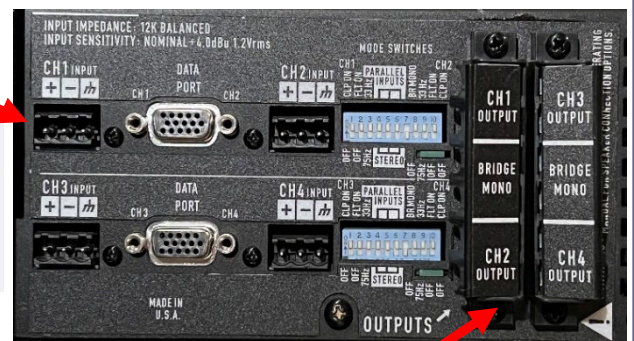
There are also many types of “multi-Channel” amplifiers available. I’ve worked with many 4 and 8-channel amplifiers. These types of amplifiers are great for special applications. For example, we needed 6-8 sound effects played at different intervals in a large hallway. An 8-channel amplifier was designed into the system and did the trick. No need for multiple amplifiers – one multi-channel amplifier worked perfectly. The QSC Model# 404 amplifier (shown below) was my “go-to” workhorse amplifier for many systems over the years.



This particular power amplifier has 4 separate channels at 250 watts per channel / 8-ohms. You can also bridge Channels 1 and 2 or 3 and 4.

[Different Types of Amplifiers!](#)

This amplifier uses Euroblock (Phoenix) Connectors (Inputs), and Spade Connectors (Speaker Outputs).



## Networked Amplifiers

As previously stated, the “Digital” world is here, and amplifiers with built-in Networking capabilities are becoming more common than ever. Newer networking technologies allow more control, streaming audio, and faster communication. With these new technologies, there is a demand for audio technicians to understand the IT (Information Technology) and networking parts as well. It would benefit any current audio technician to become proficient in networking.



Courtesy of QSC

Amplifiers are getting more efficient and packing more power and features – not to mention the incredible Networking capabilities. The CX-Q Series is an excellent example of this! The CX-Q 2K4 Model (shown left) is designed for the Q-SYS Platform, features four channels, capable of delivering customized power output loading, and has a maximum power of up to 2000 Watts. Check out our DSP section for more information regarding Q-SYS.

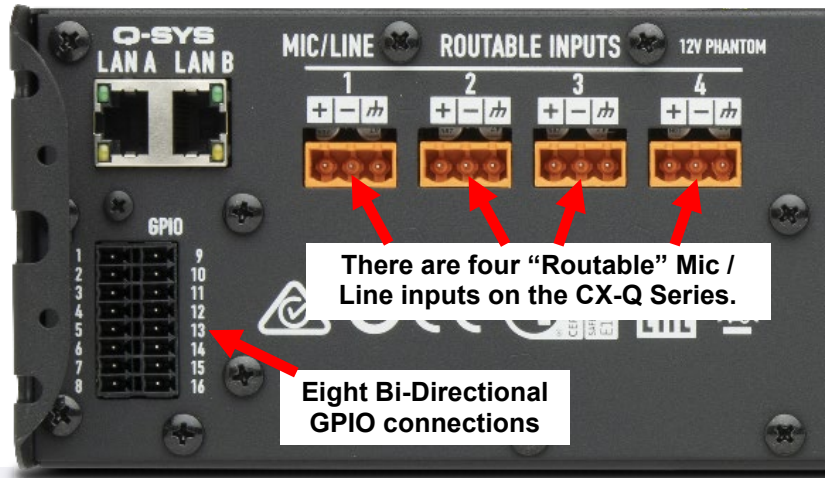
For simplicity’s sake, all CX-Q network amplifiers now feature Q-SYS network connectivity and “Routable” Mic / Line inputs, providing additional on-ramps into the Q-SYS Ecosystem when you need them.

**What are Routable Mic / Line Inputs?**  
Once a Microphone or Line Level signal is connected to a “routable” input – it does not have to go directly to the amplifier. The Q-SYS software allows you to “route” any of the signals to other devices on the network or to any of the channels on the amplifier.

Eight bi-directional GPIO connections, accessible anywhere on the Q-SYS network, provide further control integration opportunities for third-party peripherals, such as Digital Inputs and Outputs, Analog Inputs, etc. GPIO stands for “General Purpose Input / Output.”

Q-SYS CX-Q Series network amplifiers combine a legacy of robust power amplifiers, advancements in high-efficiency output devices, and native network transport, control, and monitoring capabilities. CX-Q Series features four-and eight-channel models capable of delivering customized power output loading and total maximum power of up to 8000 Watts. All channels have low impedance, 70V or 100V direct drive.

Courtesy of QSC



There are four “Routable” Mic / Line inputs on the CX-Q Series.

Eight Bi-Directional GPIO connections



### What are DataPorts?

Earlier capabilities of QSC Amplifiers included DataPort. DataPort provided control capabilities for amplifiers and speakers. Some DataPort features included converting audio signals from digital to analog and remote monitoring of systems (clipping, temperature, open or shorted conditions, power, impedance – to name a few). Also, gain adjustments, mute, and signal status.

There are many types of Amplifiers and Technologies to consider for different applications. Amplifier selection is mainly a “subjective” process but can also be a “budgetary” decision as well. Are you interested in learning more about Q-SYS? There are several different programming/training levels available (check out the link below). Combo Mixer / Amplifiers, which are widely used in “Commercial” sound systems, are covered on the next page.

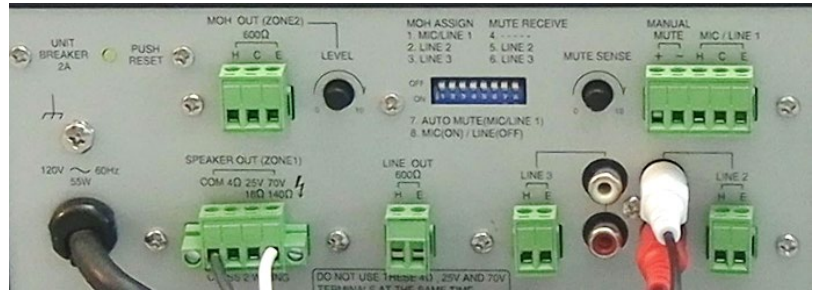
## Combo Mixer / Amplifiers

Combination Mixer / Amplifiers are very versatile pieces of equipment when it comes to “Commercial” type installations. They come in many sizes and wattages and are very easy to set up and install. You can wire up a couple of 8-ohm speakers or multiple 70-Volt speakers. Combo Mixer / Amplifiers are used everywhere in the audio world (Malls, Airports, Restaurants, Offices, and Theme Parks, to name a few). Audio Technicians should make time to familiarize themselves with this type of equipment (as well as with 70-Volt Systems).



[Video Clip!](#)

The Mixer / Amplifier shown above is a Toa brand model# BG-235. It has a Microphone input, two Line inputs, muting capabilities, and a Line Out, to name a few features. This is a very compact but versatile piece of audio equipment. Great for grocery stores, gift shops, and small compact installations.



The rear panel uses Euroblock connectors for both the Inputs and Speaker Outputs. In this example, we have a CD player plugged into Line 2 and using the 70-Volt speaker output. For one of my installations, I installed 20 each / 70-Volt Speakers, tapped at 1 Watt each, connected to this exact Mixer / Amplifier. I got plenty of level, headroom, and it sounded great! Many features include Muting (Automatic / Manual), Music on Hold, Zoning, Auto Paging, Automatic Spiels, Multiple Mic / Line Input Channels, and more.

### Power Amplifier “Technical” Notes / Tips:

→ Can an “Undersized Amplifier” damage your speakers? Yes and No! It depends on how hard you push the amplifier. Example: Let’s say you use a 100-Watt amplifier with a 300-Watt speaker. If the audio sounds good and the amplifier is not “clipping,” all is good. The issue with using undersized amplifiers occurs when you start driving the amplifier harder and harder, and the amplifier starts to “Clip.” Speakers can handle short-term peaks (bursts of sound) but not consistent and “continuous” clipping from the amplifier.

→ What does that “Red” Clip Indicator on the amplifier mean? Things can go wrong quickly when that red “clip” indicator comes on. Did the clipping just come and go in short bursts, or did the clipping stay in the red for long periods? Solid Red means Stop! Just like a traffic signal. Once the signal stays in clip and the signal starts distorting – equipment starts overheating, and damage can occur. The amplifier is now beginning to drive the speaker cone past its limits. Once excessive “clipping” occurs, the speaker cones stop moving. The excessive clipping has changed the audio signal (an AC signal) to a DC signal, which is very harmful to speakers. The “high-frequency components” of the speaker are usually the first to become damaged. Again, short bursts of clipping will be fine, but when you start to see “Solid Red,” it’s time to stop!

### Important Technical Note:

There is a correct way (sequence) to turn on and off a sound system. Turning on and off a sound system randomly can eventually cause potential damage to equipment and speakers. There is a power on / off sequence that you should use when turning your sound system on and off.

#### Powering on / off sound systems – Proper Sequence:

- Powering System ON = Turn on all processors, electronics first – then turn on the amplifiers last.
- Powering System OFF = Turn off the amplifiers first and wait 20 seconds – then turn off all the processors, electronics last.



Whirlwind PLR-PS2 with Rack Lighting

**Power Sequencers:** A power sequencer / surge suppressor can turn on / off your equipment in “time intervals” by pressing just one button / switch.

[Video Clip!](#)