



# SETTING THE MX8700 FRONT PANEL POWER AMP GAIN SWITCHES

## 1. INTRODUCTION

The factory-determined settings for an MX8700 and an EAW multi-amplified loudspeaker set the level balance between and the limiting thresholds for each passband of the loudspeaker. These settings depend on a specific voltage gain between each MX8700 output and the inputs to the loudspeaker. In most cases, this gain is the sum of the gain in the analog output section in the MX8700 plus the gain of the power amplifier connected to that output.

## 2. POWER AMPLIFIER GAINS

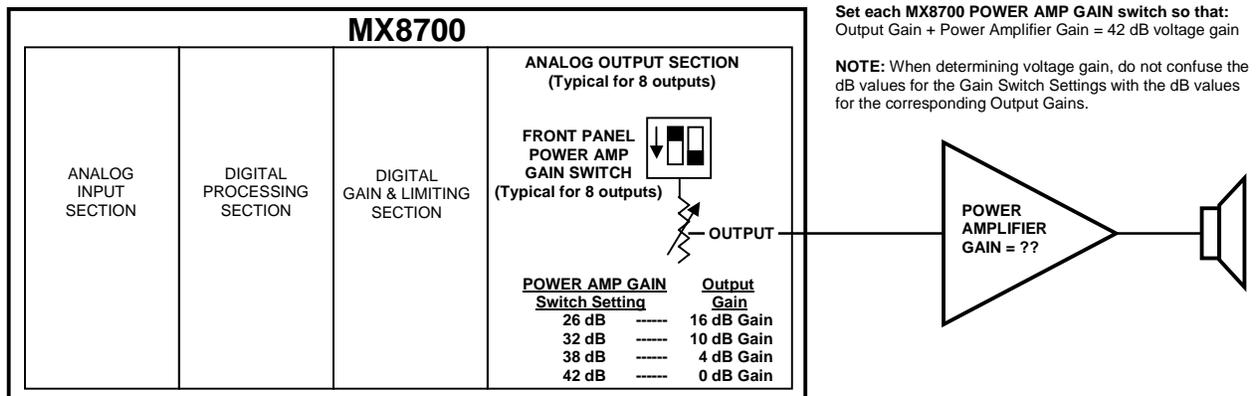
The gain of power amplifiers can vary from model to model, from series to series, and from manufacturer to manufacturer. In addition, most power amplifiers have some means for the user to adjust their gain. This can vary from a simple, variable, input attenuator to precision, fixed switch settings. It should be obvious, because of these facts, that EAW cannot know what the gains are of the power amplifiers that will be connected to an MX8700.

## 3. THE GAIN SWITCHES (See Figure 1)

To accommodate different power amplifier gains, each analog output section of the MX8700 has POWER AMP GAIN dip switches on the front panel. These switches MUST be programmed to match the gain in dB of the power amplifier connected each MX8700 output. In many cases, the gain of the power amplifier must be adjusted to match one of the POWER AMP GAIN switch settings.

The intent of setting the POWER AMP GAIN switches is to make the analog gain in each MX8700 output plus the gain of its connected power amplifier equal to a total voltage gain of 42 dB. If these gains do not add up to 42 dB for each output, then the digital processing settings for the loudspeaker's frequency balance will no longer be correct and the digital limiting will be either under or over-protective.

**NOTE:** The MX8700 POWER AMP GAIN adjustments will affect the operation of, but do NOT actually adjust, the MX8700s digital gains (which establish the loudspeaker's spectral balance) and limiter thresholds (which establish power amplifier output levels at limiting).



**Figure 1: Required MX8700 / Power Amplifier Gain Structure**



#### 4. MX8700 GAIN OPTIONS (See Figure 2)

The graphic at the top of the MX8700's front panel shows the four available options for setting the POWER AMP GAIN switches. They are 26 dB, 32 dB, 38 dB, and 42 dB.

The actual gain for each POWER AMP GAIN switch setting is shown in Figure 2 below. Note that the higher the POWER AMP GAIN switch setting, the less the MX8700's output gain. Also, note that the POWER AMP GAIN switch setting plus the Output Gain always totals 42 dB.

Power Amp Gain Switch Setting	MX8700 Output Gain
26 dB	16 dB
32 dB	10 dB
38 dB	4 dB
42 dB	0 dB

**Figure 2: MX8700 Output Gain Options**

#### 5. DETERMINING YOUR POWER AMPLIFIER GAIN

Determine the voltage gain in dB for each power amplifier connected to the MX8700. This is the ratio of the power amplifier's output to input voltage. If this is not listed in the power amplifier's published specifications, contact the power amplifier manufacturer for assistance. A power amplifier's gain is not its sensitivity rating, nor does the sensitivity rating affect the gain. Likewise, a power amplifier's gain is usually not the markings on the input attenuator. In addition, a power amplifier's gain is not related to either its power output rating or the loudspeaker load.

For example, assume two power amplifiers have identical voltage gains. One is driving a 4 ohm load and the other an 8 ohm load, each has a different sensitivity rating, and each has a different power output rating. However, because they have the same voltage gain, the same input voltage will produce the same output voltage from both power amplifiers, regardless of the other differences.

Normally a power amplifier's gain is specified with its input attenuator set to minimum attenuation. This usually means a fully clockwise setting. However, in many cases, proper system gain structure may dictate that power amplifier input attenuators be set with some attenuation. In some cases, there may be other equipment between the MX8700 and the power amplifier, such as a distribution amplifier. For either of these situations, it is advisable to measure the voltage difference between each MX8700 output and the output of its connected power amplifier. This is best measured using a sine wave test signal in the middle of the passband for each output. (Disconnect the loudspeakers for this purpose!). Convert the measured voltage ratio to dB using this formula and use the answer as the power amplifier's voltage gain:

$$\text{Power amplifier Gain} = 20 \times \log(\text{power amplifier output voltage} / \text{MX8700 output voltage})$$

**NOTE:** Many power amplifiers have fixed gain adjustments in addition to, or in place of, variable input attenuators. If available, set each power amplifier's voltage gain to a value that exactly matches one of the POWER AMP GAIN switch settings: 26dB, 32 dB, 38 dB, or 42 dB. If this is the case, use Option #1 below for setting the POWER AMP GAIN switches. If feasible, it is recommended that all power amplifier voltage gains be set to the same value. If more than one of the available power amplifier gain settings is a match for the POWER AMP GAIN switch settings, it does not matter which one you choose to use.



## 6. SETTING THE MX8700 POWER AMP GAIN SWITCHES

There are three options for setting the POWER AMP GAIN switches on each MX8700 output. The choice in each case will depend on the particular power amplifier.

**CAUTION:** Do not use a POWER AMP GAIN switch setting that is simply close to the power amplifier gain. Do not set them all to some arbitrary setting. Failure to adjust the MX8700 and power amplifier input attenuators as described in the below Options, will result in improper operation. This may include incorrect spectral balance between the different frequency bands and limiting that is too protective or not protective enough.

### **OPTION 1: Your power amplifier gain matches any one of the GAIN switch settings**

Set each output's POWER AMP GAIN switch to the same value as the gain of the power amplifier connected to the output.

Example: The power amplifiers connected to the MX8700 have 26 dB and 32 dB gains. Set the GAIN switches to 26 dB on the MX8700 outputs connected to the 26 dB gain power amplifiers and to 32 dB on the MX8700 outputs connected to the 32 dB gain power amplifiers.

### **OPTION 2: Your power amplifier gain does not match any of the GAIN switch settings**

Set each output's POWER AMP GAIN switch to the nearest setting BELOW the gain of the power amplifier connected to that output. Then turn the power amplifier's input attenuator down by the difference between the power amplifier gain and the POWER AMP GAIN switch setting. This should be set by measurement. Do not rely on an power amplifier's variable input attenuator labeling because these are normally not calibrated settings.

Example: A power amplifier has 30 dB voltage gain. Set the POWER AMP GAIN switch to 26 dB and turn the power amplifier's input attenuator down by 4 dB. The 4 dB is the difference between the 30 dB power amplifier gain and the 26 dB POWER AMP GAIN switch setting.

If the power amplifier input attenuator is not adjusted as described, the gain in this example would be 4 dB more than is needed for the processor's settings. This means the limiting would be under-protecting by 4 dB. It also may be possible to drive the power amplifier into clipping before limiting occurs. Lastly, the loudspeaker's spectral balance may be off.

### **OPTION 3: You think Option 1 and 2 are too complicated to figure out**

You can determine how to set the POWER AMP GAIN switches by using EAW's "Limiter Setting Calculator". This is a Microsoft® Excel spreadsheet found in the EAW's web site ftp directories. You will need to enter for your power amplifier either its gain in dB or these specifications: input sensitivity in volts, power output in watts, and the load impedance at the power output.

## 7. SUMMARY

The loudspeaker's correct spectral balance and limiting thresholds depend on the voltage gain in the analog output sections of the MX8700 plus the voltage gains of the connected power amplifiers. The POWER AMP GAIN switches allow adjustment of the MX8700's output gains. In order to achieve the factory-determined spectral balance and limiting thresholds, this MX8700 analog Output Gain plus the gain of the connected power amplifier must equal 42 dB voltage gain.

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