



# PowerMatch

## Application Note: High-impedance Loads in Mono Mode

### Introduction

On all PowerMatch configurable power amplifiers, constant-voltage (high-impedance or “hi-Z”) operation is typically accomplished by using V-Bridge Mode (2 channels bridged) or Quad Mode (4 channels combined). In these modes, you can select the appropriate configuration for 70V or 100V operation. However, some users have expressed a desire to use a single channel in Mono Mode to drive 70V or 100V loudspeakers.

The capability to drive 70/100V distribution lines is possible as a derated use (referred to as “50V Mode” in this document) and requires additional consideration: each loudspeaker’s maximum effective tap setting is now only ½ of the highest 70V tap (for more information, see **Background**). The full amplifier rating of a single channel is still available. The following table provides a comparison between V-Bridge Mode and Mono Mode to drive 70/100V distribution systems:

	Single channel “50V Mode”	70V Hi-Z	100V Hi-Z
Output configuration	Mono	V-Bridge (70V)	V-Bridge (100V)
Loudspeaker tap setting	2X desired wattage (70V input) 4X desired wattage (100V input)	Desired wattage (using 70V input)	Desired wattage (using 100V input)
Limiter threshold settings	Must modify limiter settings: set to $50 V_{RMS} / 71 V_{Peak}$	$71 V_{RMS} / 100 V_{Peak}$	$100 V_{RMS} / 142 V_{Peak}$
Open circuit alarm	Recommend disabled	Automatically disabled	Automatically disabled

Driving high-impedance loudspeakers from a single PowerMatch amplifier channel.

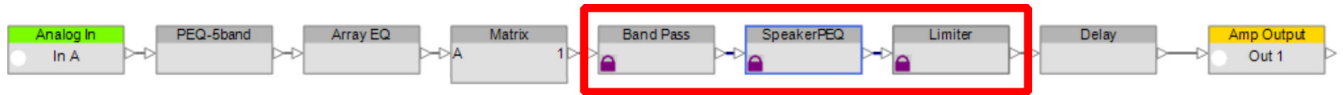
**Example:** A customer has a large area using a design that requires 20 FreeSpace FS4CE loudspeakers, each tapped at 20 W. In this scenario, they can use a single channel of a PowerMatch PM4500N amplifier (Mono Mode) with the loudspeaker tap settings at the 40 W/70V position. They will still have sufficient power from the PM4500N amplifier with the 20 loudspeakers in the zone because the effective loading will be 400 W (20 W × 20 loudspeakers). This is a good fit as the effective loading is still less than the available 500 W per channel from the PM4500N.

### Special Considerations When Configuring PowerMatch Amplifiers for Mono Mode Constant-Voltage Use

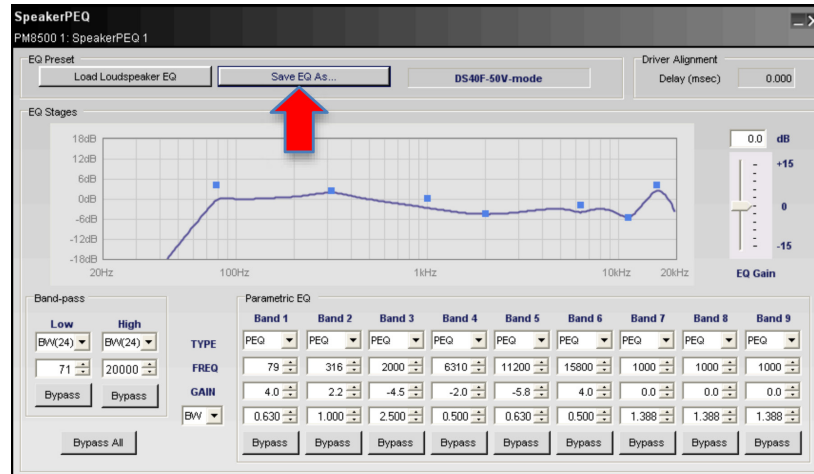
- Using ControlSpace Designer software, you can select various PowerMatch fault conditions that could trigger the fault alarm (for more information, see the ControlSpace Designer help file). Once an alarm condition is met, a contact closure on the amplifier activates and fault indicators on the amplifier’s front panel and in ControlSpace Designer illuminate to alert you of a potential problem. **One of the alarm conditions, open circuit detection, should be deselected while using high-impedance loads.** Because some constant-voltage installations have zones configured for very low power, a PowerMatch amplifier could detect a high impedance and misinterpret the circuit as an open circuit. For example, in a 100V system, a 1 W load presents an impedance of 10 kΩ, which is too high to be measured by the amplifier’s open circuit detector.
- When a PowerMatch amplifier is in Mono Mode, selecting a FreeSpace loudspeaker assumes that the loudspeaker’s input is set to the 8Ω direct input rather than the 70V or 100V input. Therefore, the limiter settings are adjusted to much lower peak and RMS levels to prevent the PowerMatch amplifier from overpowering the loudspeaker. Note that the limiter settings are automatically set for  $71 V_{RMS} / 100 V_{Peak}$  in 70V mode and  $100 V_{RMS} / 142 V_{Peak}$  for 100V mode.

To use Mono Mode for 70/100V operation, follow the workaround steps below to manually readjust those limits to the default settings of  $71 V_{Peak}$  and  $50 V_{RMS}$ .

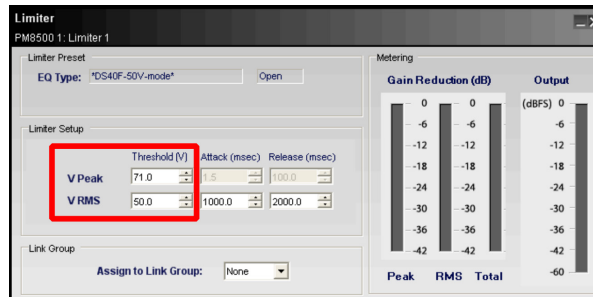
- I. In ControlSpace Designer (v3.0 or later), ensure the amplifier configuration is set to Mono Mode, and then double-click the appropriate **SpeakerPEQ** block. Then, select the desired model from the **Load Loudspeaker EQ** button's list. Once the loudspeaker file is loaded, all of the Bandpass, Speaker EQ and Limiter settings will be locked, indicated by a lock symbol.



- II. After choosing the correct model, click **Save EQ As...** to save a **.seq** file with a different file name (e.g., **FS4CE-50V\_mode.seq**). This will unlock the previously locked settings.



- III. Double-click the appropriate **Limiter** block, and change the values in the **Threshold (V)** column for **V Peak** and **V RMS** to **71.0** and **50.0** respectively.



- IV. To configure other channels in the same way, repeat Steps B and C for those channels. You can load and save loudspeaker EQs for different models or copy and paste functions to copy settings to other channels.

## Background

“Constant voltage” is a misnomer: a 70V system can be loosely defined as an amplifier that outputs about  $70 V_{RMS}$  maximum. This amplifier drives multiple transformer-coupled loudspeakers that load the 70V line at a selected wattage. The voltage is not constant at all — it’s audio. Any intelligible music or speech signal will generally result in a loudspeaker’s long-term power dissipation of 50% of the tap setting or less.

The simplest description of a PowerMatch channel in Mono Mode is a 50V system instead of the more common 70V and 100V systems. “Power =  $V^2/Z$ ” implies that regardless of the tap setting used on the loudspeaker, while using the loudspeaker’s 70V input, the effective tap setting will be exactly  $\frac{1}{2}$  of the physical switch or jumper setting. Alternatively, while using the loudspeaker’s 100V input, the effective tap setting will be exactly  $\frac{1}{4}$  of the physical switch or jumper setting. This effective tap setting, not the physical switch/jumper setting, should be used to determine the power load to the amplifier channel. Each channel of a PowerMatch PM8500N or PM4500N amplifier offers 500 W maximum in Mono Mode, while each channel of a PM8250N or PM4250N offers 250 W maximum.