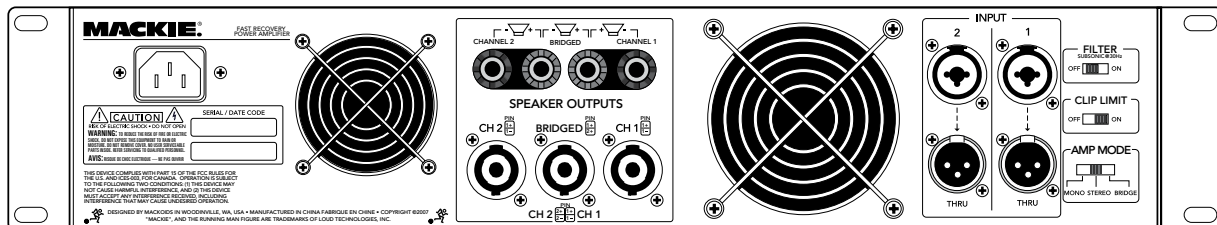


FRS Series

TWO CHANNEL POWER AMPLIFIERS

FRS•1300, FRS•1700, and FRS•2800

OWNER'S MANUAL



MACKIE®

Important Safety Instructions

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. Only use attachments/accessories specified by the manufacturer.
12. Use only with a cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. This apparatus shall not be exposed to dripping or splashing, and no object filled with liquids, such as vases or beer glasses, shall be placed on the apparatus.
16. This apparatus has been designed with Class-I construction and must be connected to a mains socket outlet with a protective earthing connection (the third grounding prong).
17. This apparatus has been equipped with an all-pole, rocker-style AC mains power switch. This switch is located on the front panel and should remain readily accessible to the user.
18. This apparatus does not exceed the Class A/Class B (whichever is applicable) limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

ATTENTION — *Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de class A/de class B (selon le cas) prescrites dans le règlement sur le brouillage radioélectrique édicté par les ministere des communications du Canada.*

19. Exposure to extremely high noise levels may cause permanent hearing loss. Individuals vary considerably in susceptibility to noise-induced hearing loss, but nearly everyone will lose some hearing if exposed to sufficiently intense noise for a period of time. The U.S. Government's Occupational Safety and Health Administration (OSHA) has specified the permissible noise level exposures shown in the following chart.

According to OSHA, any exposure in excess of these permissible limits could result in some hearing loss. To ensure against potentially dangerous exposure to high sound pressure levels, it is recommended that all persons exposed to equipment capable of producing high sound pressure levels use hearing protectors while the equipment is in operation. Ear plugs or protectors in the ear canals or over the ears must be worn when operating the equipment in order to prevent permanent hearing loss if exposure is in excess of the limits set forth here.

PORTABLE CART WARNING



Carts and stands - The Component should be used only with a cart or stand that is recommended by the manufacturer. A Component and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the Component and cart combination to overturn.

Duration Per Day In Hours	Sound Level dBA, Slow Response	Typical Example
8	90	Duo in small club
6	92	
4	95	Subway Train
3	97	
2	100	Very loud classical music
1.5	102	
1	105	Dave screaming at Steve about deadlines
0.5	110	
0.25 or less	115	Loudest parts at a rock concert



CAUTION AVIS

RISK OF ELECTRIC SHOCK
DO NOT OPEN
RISQUE DE CHOC ELECTRIQUE
NE PAS OUVRIR



CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK
DO NOT REMOVE COVER (OR BACK)
NO USER-SERVICEABLE PARTS INSIDE
REFER SERVICING TO QUALIFIED PERSONNEL
ATTENTION: POUR EVITER LES RISQUES DE CHOC
ELECTRIQUE, NE PAS ENLEVER LE COUVERCLE. AUCUN
ENTRETIEN DE PIECES INTERIEURES PAR L'USAGER. CONFIER
L'ENTRETIEN AU PERSONNEL QUALIFIE.
AVIS: POUR EVITER LES RISQUES D'INCENDIE OU
D'ELECTROCUTION, N'EXPOSEZ PAS CET ARTICLE
A LA PLUIE OU A L'HUMIDITE

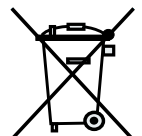


The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure, that may be of sufficient magnitude to constitute a risk of electric shock to persons.
Le symbole éclair avec point de flèche à l'intérieur d'un triangle équilatéral est utilisé pour alerter l'utilisateur de la présence à l'intérieur du coffret de "voltage dangereux" non isolé d'ampleur suffisante pour constituer un risque d'électrocution.



The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.
Le point d'exclamation à l'intérieur d'un triangle équilatéral est employé pour alerter les utilisateurs de la présence d'instructions importantes pour le fonctionnement et l'entretien (service) dans le livret d'instruction accompagnant l'appareil.

WARNING — To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.



Contents

IMPORTANT SAFETY INSTRUCTIONS	2	APPENDIX A: SERVICE INFORMATION	12
INTRODUCTION	4	TROUBLESHOOTING	12
GETTING STARTED.....	5	REPAIR	13
HOOKUP DIAGRAMS.....	6	APPENDIX B: CONNECTIONS, MATH AND STUFF	14
FRONT PANEL FEATURES	8	XLR CONNECTORS	14
1. POWER	8	1/4" TRS PHONE PLUGS AND JACKS	14
2. VENTILATION	8	1/4" TS PHONE PLUGS AND JACKS.....	14
3. METERS	8	SPEAKONS	14
4. LEVEL CONTROLS.....	8	LOUDSPEAKER CABLE	14
REAR PANEL FEATURES	9	LONGER LENGTHS	15
5. POWER CORD SOCKET	9	SPEAKER IMPEDANCES	15
6. FAN VENTS.....	9	APPENDIX C: TECHNICAL INFO.....	16
7. SPEAKER OUTPUTS.....	9	SPECIFICATIONS	16
8. COMBO INPUTS	9	BLOCK DIAGRAM	17
9. THRU OUTPUTS	9	DIMENSIONS.....	18
10. AMP MODE	10	LIMITED WARRANTY	19
11. CLIP LIMIT	10		
12. SUBSONIC FILTER	10		
GENERAL PRECAUTIONS.....	11		
AC POWER REQUIREMENTS	11		
THERMAL CONSIDERATIONS	11		
RACK MOUNTING.....	11		
MAINTENANCE	11		

Need help with your new FRS amplifier?

- Visit www.mackie.com and click Support to find: FAQs, manuals, addendums, and user forums.
- Email us at: techmail@mackie.com.
- Telephone 1-800-898-3211 to speak with one of our splendid technical support representatives, (Monday through Friday, from 7 a.m. to 5 p.m. PST).

Introduction

Congratulations on the purchase of your new Mackie power amplifier. Please read these instructions to get the maximum performance from your amplifier, and to make the technical writer feel loved.

The FRS series amplifiers are designed for continuous duty in speech, music, and sound reinforcement applications in churches, schools, offices, arenas, hotel meeting rooms, convention centers, recreation facilities and other venues demanding high performance, flexible features, and rugged dependability.

The switching power supply allows for high efficiency and performance without the heavy weight of amplifiers with conventional AC transformers.

A rear panel low-cut switch allows you to remove low frequencies, and a clip-eliminator allows extra protection for your speakers by preventing the amplifier from being overloaded.

The amplifier can operate in stereo, dual-mono, or bridged-mono. The output connections are Speakons® and binding posts for left, right, and bridged mono.

The combination inputs are capable of accepting balanced XLR, 1/4" TRS, or unbalanced 1/4" TS connections from line-level sources. Two XLR through-outputs allow the balanced input signals to be shared with other amplifiers, or powered speakers etc.. Two front panel level controls allow adjustment of the input signals.

The front panel has a rocker power switch with a power LED, and each channel has a high-resolution six-segment LED meter.

The amplifier output stage is fully protected against permanent damage caused by overloading, shorts, silky boxers, and extreme temperatures.

The front panel incorporates holes for rack mounting, where it will take up two rather lovely rack spaces. Two handles are fitted on the front panel for easy transporting.

Please write your serial number here for future reference (i.e., insurance claims, tech support, return authorization, etc.)

Purchased at:

Date of purchase:

FEATURES

- Professional lightweight power amplifier with high-power / low-distortion design
- Fast Recovery circuitry for clean, undistorted sound — even at clipping
- Ultra-light switching power supply for maximum efficiency and minimal heat
- Available in three powerful models, with continuous power @ 4 ohms bridged of:
FRS•1300: 1300 W
FRS•1700: 1660 W
FRS•2800: 2800 W
- Selectable dual-mono, stereo, or bridged-mono operating modes
- 6-segment LED meter per channel, with OL (overload) and SIG (signal present) LEDs
- Defeatable clip limiter plus short, under-impedance, over-current, and thermal protection
- 30 Hz subsonic filter maximizes amplifier efficiency and headroom
- Combo XLR/TRS input and TRS thru connectors per channel
- Detented rotary gain controls
- Speakon® and binding post outputs per channel
- Third Speakon output for bridged mono applications, also provides both output channels on a single connector (mono/stereo modes)
- Multi-speed fans adjust to operating temperature for minimal acoustic noise
- Robust, impact-resistant, all-steel 2U rack-mount chassis
- Comfortable handles for easy transport and protection of level controls

HOW TO USE THIS MANUAL

After this introduction, a getting started guide will help you get things set up fast. The hook-up diagrams show some typical setups. The features section describes every detail and control, and you'll find illustrations with each feature numbered and described.



This icon marks information that is critically important or unique to the amplifier. For your own good, read and remember them.



This icon leads you to in-depth explanations of features and practical tips. They usually have some valuable nuggets of information.

Appendix A is a section on troubleshooting and repair. Appendix B is a section on connectors. Appendix C shows the technical specifications.

Getting Started



The following steps will help you set up your amplifier, and get the levels just right.

Settings:

1. Be sure the amplifier's power switch is off.
2. Turn down both level controls.
3. On the rear panel, set the subsonic filter switch off and the clip limit switch on.
4. Determine which amp mode is best for your application:

Stereo mode is the typical setup for amplifying stereo signals. Input 1 is routed to channel 1 output, and input 2 is routed to channel 2 output.

Mono mode is used for sending a mono signal to both outputs, with separately adjustable level controls. Input 1 is used in mono mode (leave input 2 disconnected).

Bridge mode uses both amplifier channels to power one speaker (or set of speakers). Input 1 is used in bridge mode (leave input 2 disconnected and its level control turned down).



Note: 4 ohms is the minimum speaker impedance you should connect to the amplifier in bridge mode.

5. Set the amp mode switch according to your application and delicate sensibilities.

Connections:

1. Using balanced cables, make connections from your mixer (or other signal source) main out to your amplifier's inputs.
2. In stereo mode, connect the cables from your signal source to the amplifier's combo input jacks, either XLR or 1/4" TRS. The XLR and TRS inputs for each channel are wired in parallel.
 - The balanced XLR inputs are wired as follows:
Pin 1 = shield (ground)
Pin 2 = hot (+)
Pin 3 = cold (-)
 - The 1/4" TRS inputs are wired as follows:
Tip = hot (+)
Ring = cold (-)
Sleeve = shield (ground)
3. In mono mode and bridge mode, connect one cable from the input source to input 1, and connect nothing to input 2.
4. In stereo and mono modes, connect speaker cables to the speaker outputs, either the binding posts or the Speakon connectors.

- The binding post connectors are wired as follows:
Red = hot (+ speaker terminal)
Black = cold (- speaker terminal)
 - The speakon connectors are wired as follows:
1+ = hot (+ speaker terminal)
1- = cold (- speaker terminal).
5. In bridge mode, if using the binding post outputs:
Ch 1 red post = hot (+ speaker terminal)
Ch 2 red post = cold (- speaker terminal)
Do not use the black terminals.

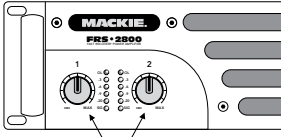
If using a speakon, connect it to the center bridged speakon connector. This is wired as follows:
1+ = hot (+ speaker terminal)
2+ = cold (- speaker terminal)
 6. Plug all the sound system components into suitable AC outlets, properly grounded and capable of delivering adequate current.
 7. Make sure your signal source is powered up and delivering signal to the amplifier.
 8. Turn the power amplifier's switch on. Verify that the power LED lights.
 9. Slowly turn up both level controls on the amplifier. You should hear music and see the meters and sig LEDs flashing. If the OL (overload) LEDs are flashing, turn down either the level controls on the amp or the source signal's output level controls (i.e., master faders), until the OL LEDs either blink occasionally or not at all.
 10. For quieter listening, it is preferable to adjust the amp's level controls rather than the source signal's output level (unless you have the source's control all the way up!).

Things to remember:

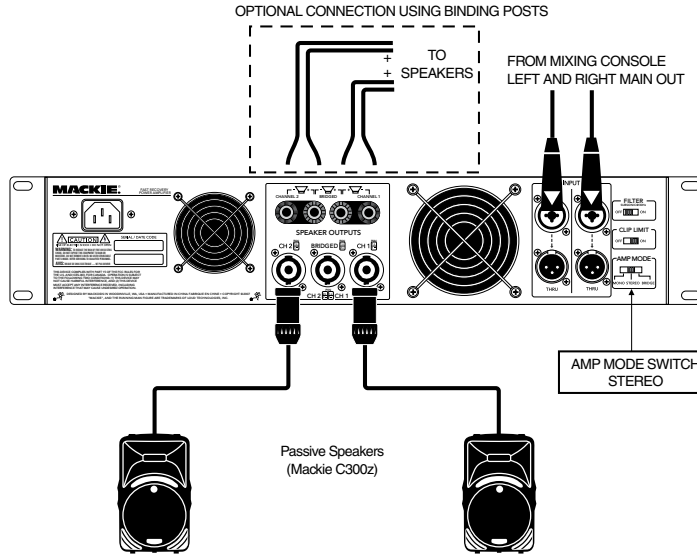
- Never plug amplifier outputs into anything except speakers (unless you have an outboard box specifically designed to handle speaker-level signals). Pumpkins are right out.
- Before making connections to an amp or reconfiguring an amp's routing, turn the amp's level controls down, turn the power off, make the changes, turn the power back on, and then turn the level controls back up.
- If you shut down your equipment, turn off the amplifiers first. When powering up, turn on the amplifiers last.

Hookup Diagrams

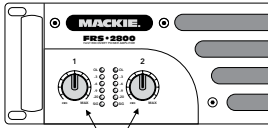
Stereo



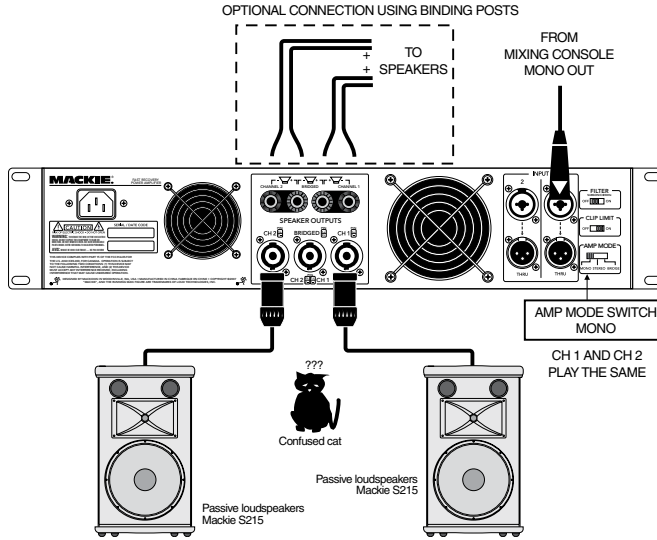
In STEREO mode, both gain controls are used to achieve a nice balance



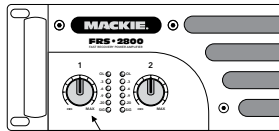
Dual mono



In MONO mode, both gain controls are used to achieve a nice balance

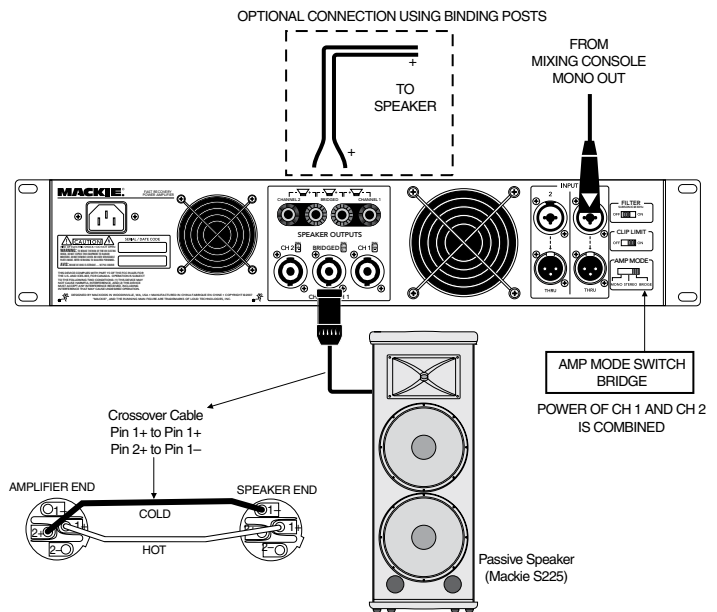


Bridged mono



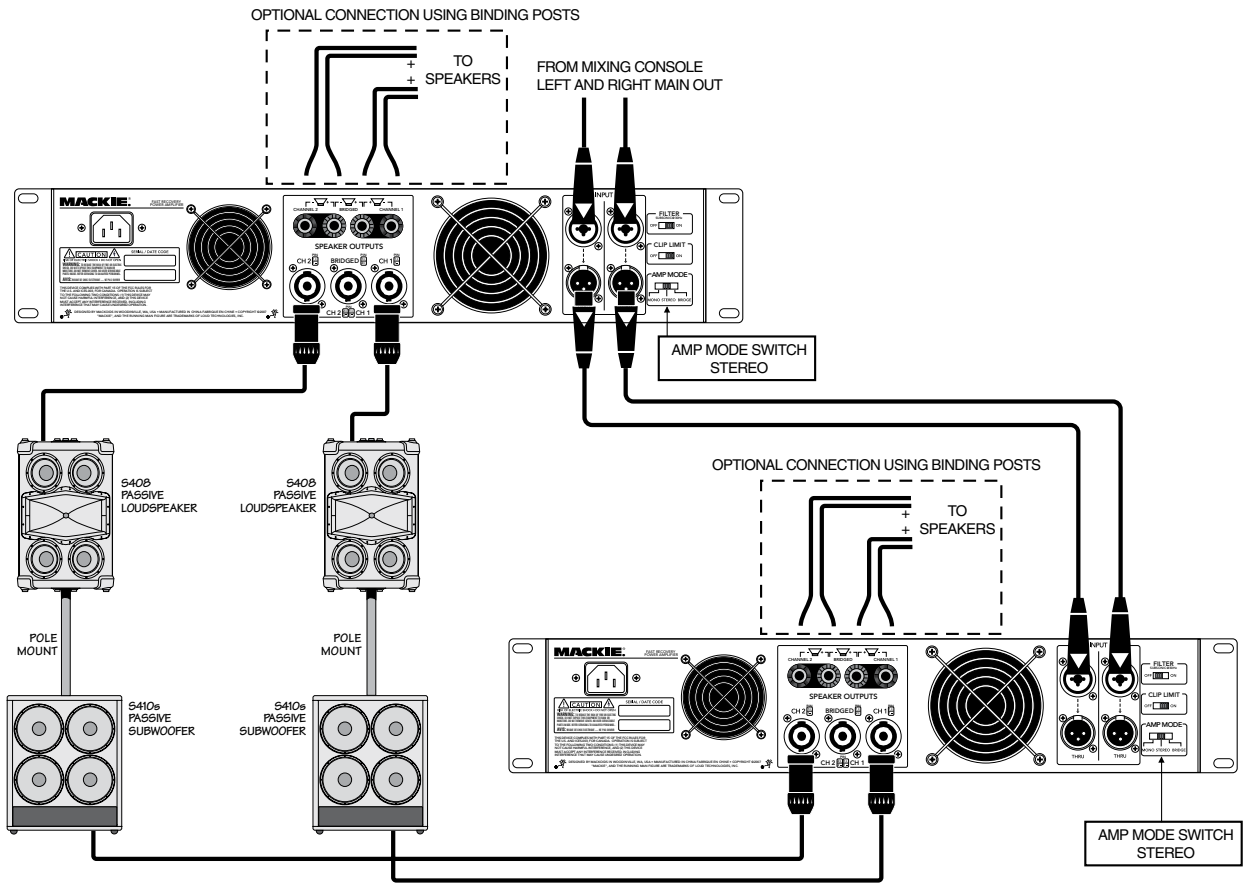
In BRIDGED mode, only use this gain control

If you have two amplifiers, each could power a single speaker in bridged mono, to make a very powerful stereo system. Use a stereo feed from your mixing console, the left goes to one amp, and the right goes to the other.

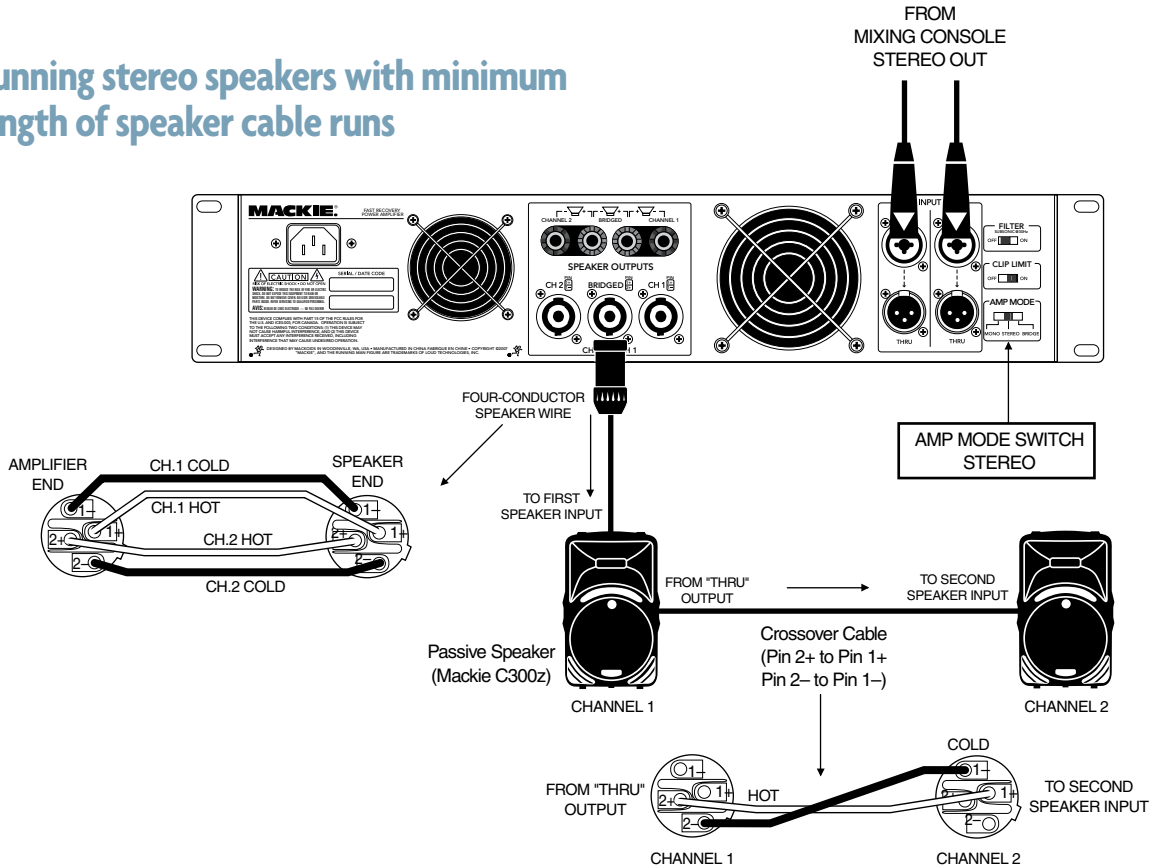


STEREO, DUAL MONO, AND BRIDGED MONO

Daisy-chaining two stereo amplifiers



Running stereo speakers with minimum length of speaker cable runs



DAISY CHAINING AND A SPECIAL CASE

Front Panel Features

1. POWER

Use this rocker switch to turn the unit on or off. This connects/disconnects the AC power to the amplifier's switching power supply.

The amplifier is on when the top of the switch is pressed in. It is off when the bottom of the switch is pressed in.

The LED at the top of the switch will light when the power switch is on.

2. VENTILATION

Keep these ventilation slots free from any obstructions, so the air may flow freely and cool down the power transistors.

3. METERS

OL is short for "overload." These indicate when the output of the amplifier has reached the maximum, and is right on the edge of clipping. Clipping is very bad for speakers and should be avoided to prevent damage.

It is okay if the OL LEDs blink occasionally. It means that the transient peaks of the music are just hitting the full output of the amplifier. However, if the OL LED is blinking frequently or continuously, turn down the source signal (i.e., the mixer's master faders) or the amplifier's level controls.

The meters indicate the signals are below maximum output power by: -3 dB, -6 dB, -9 dB, and -20 dB.

SIG is short for "signal present." These LEDs indicate when a signal is present after the level controls, at the output stage of the power amplifier. If the level controls are turned all the way down (fully counterclockwise), these indicators will not light.

4. LEVEL CONTROLS

These two knobs control the levels of channels 1 and 2. The knobs are detented to make it easy to set both controls to the same level. Usually, these are set all the way up.

You might turn them down slightly if you have high-efficiency speakers. Also, you could use them to control the level of line-level sources such as a CD player connected directly to the amplifier without a preamplifier or mixer.

The amplifiers are designed so that a +3.4 dBu (1.15 Vrms) input signal drives the amplifier to full power into 4 ohms:

FRS•1300 = 420 watts per channel into 4 ohm

FRS•1700 = 540 watts per channel into 4 ohms

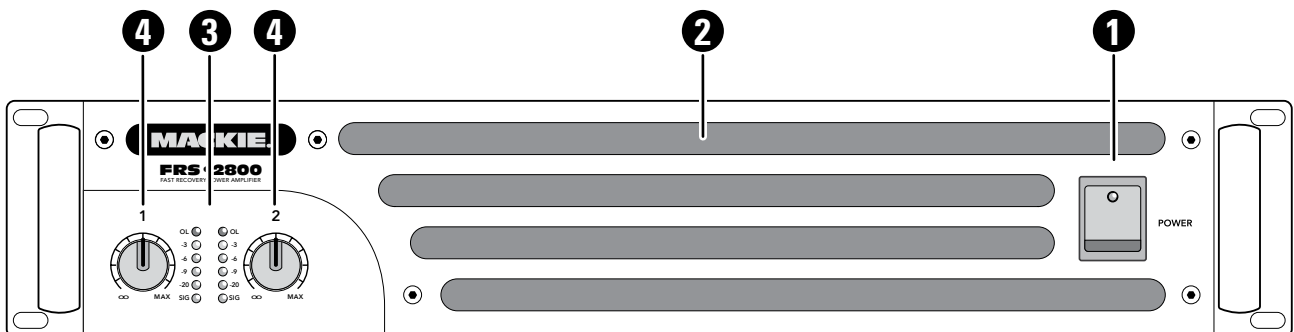
FRS•2800 = 850 watts per channel into 4 ohms

This equates to a gain of 32 dB, 33 dB, and 35 dB respectively.

After you have set the levels for the mixer (or other signal source), adjust the level controls on the amplifier as the final adjustment to set the overall volume for the system.

In stereo and mono mode, use both level controls to control the levels going to each speaker.

In bridged mono mode, turn the channel 2 level control down, and just use the channel 1 control.



Rear Panel Features

5. POWER CORD SOCKET

This is where you connect the detachable power cord included with your amplifier. Plug the other end of the power cord into an AC outlet properly configured with the voltage required for your particular model.

Be sure the AC outlet can supply enough current to allow full power operation of all the amplifiers plugged into it. The outlet should be a three-prong socket that matches the power cord.

6. FAN VENTS

VERY IMPORTANT Do not obstruct the ventilation openings of the amplifier. Fans move air over the heat-sinks to cool down the power transistors. If these vents are restricted then the amplifier may over-heat and shut down.

7. SPEAKER OUTPUTS

There are two options for connecting your speakers: binding posts and Speakon connectors.

Normally, you would use either the binding posts or the Speakon connectors. Since the connectors are wired in parallel (e.g., channel 1 binding post and Speakon are in parallel, and channel 2 binding post and Speakon are in parallel), you can connect a speaker to each connector, as long as the total impedance per channel is not less than two ohms.

- Two 8 ohm speakers in parallel equals 4 ohms.
- Two 4 ohm speakers in parallel equals 2 ohms.

When the amplifier is used in bridged-mono mode, use either the center Speakon, or the two red binding posts to connect your single speaker.



In bridged-mono mode, do not use a speaker impedance less than 4 ohms. Be careful as both speaker wires are live. Do not connect the speaker wires to any external device that is grounded.

8. COMBO INPUTS

These combination inputs allow you to connect balanced XLR plugs or 1/4" plugs.

The XLR inputs are wired conventionally, with pin 2 hot, pin 3 cold, and pin 1 ground.

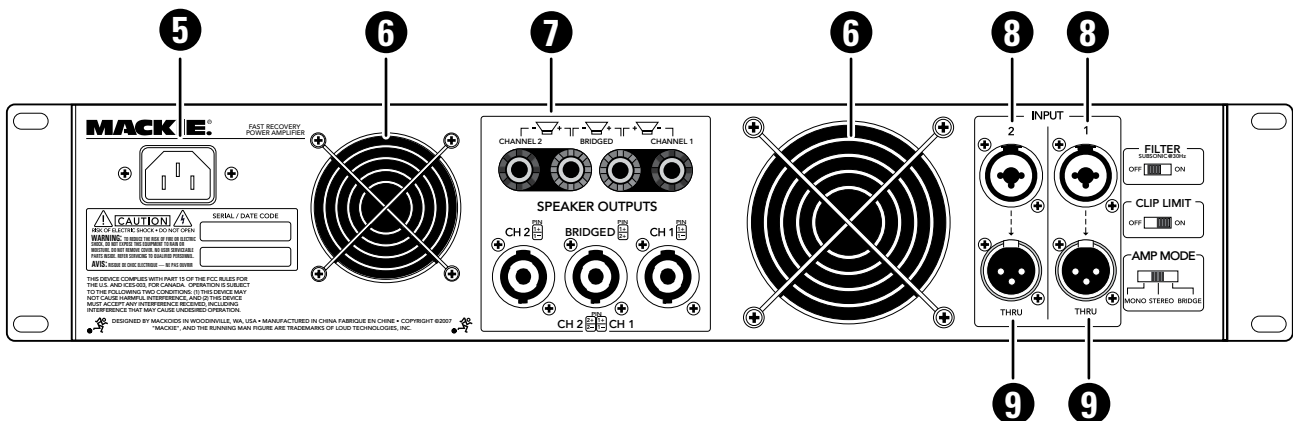
The 1/4" inputs allow you to connect balanced 1/4" TRS or unbalanced TS plugs from line-level sources.

Use balanced connections where possible, as these offer better rejection of noise than unbalanced lines.

Use high-quality, three-conductor shielded cable for balanced connections. The better the shield, the better the audio signal is protected from induced EMI and RFI.

9. THRU OUTPUTS

These male XLR connectors allow you to send the balanced input signals to other amplifiers, powered speakers, mixers, or recorders in your system. The line-level output is a straight copy of what goes in, and the amplifier level controls [4] and switches have no effect.




10. AMP MODE

This switch determines the input signal routing within the amplifier. For most applications, you will use the stereo setting. However, some applications might be better suited for using either the mono or the bridge setting.

Stereo: This is the normal position used when amplifying stereo signals. This mode accepts separate left and right inputs (1 and 2), and routes them to the channel 1 and channel 2 outputs. Each channel's level control adjusts the gain for its own channel, and each channel is independent.

Mono: This mode (also known as dual-mono) is used when you want to send a mono signal to both outputs. It accepts a single input (input 1), and routes it to both the channel 1 and channel 2 amplifiers. Each channel's level control adjusts the gain for its own channel.

Bridge: This mode (also known as bridged-mono) accepts a single input (input 1), and uses both amplifier outputs to power one speaker. Use the channel 1 level control to adjust the gain (turn the channel 2 level control all the way down). The hookup diagram at the bottom of page 6 shows how to connect a speaker in bridged mono.

VERY IMPORTANT  **WARNING:** In bridged mode, both connections to your speaker are live; that is, neither is grounded through the chassis (because the black binding posts are not used).

11. CLIP LIMIT

When engaged, this switch protects your loudspeakers from the effects of clipping. It is designed to be virtually transparent, meaning you probably won't even notice any audible difference when the switch is turned on.

We recommend that you leave this switch on at all times. However, if you are working at quiet levels, or you have already placed a compressor/limiter in the signal path, you can leave this switch off.

The limiter senses when the amplifier is about to be overdriven and attenuates the overall level just enough to keep the signal from clipping. Clipping occurs when

the output voltage no longer linearly follows the input voltage. As the amplifier output voltage increases, it will eventually run into the internal DC power supplies and start to flatten out. The flat tops represent a DC voltage reaching your speakers, which interrupts the natural movement of the speaker's voice coil. High frequency harmonics are also produced which can play havoc with your tweeters. Square waves sound awful, and could possibly damage your speakers and/or your reputation.



Speakers are designed to handle good clean continuous signals, but give them a clipped signal and even high-power speakers can be damaged. For example, a 100 watt amplifier that is clipping, can damage speakers that are rated at 400 watts.

The limiter is especially handy when you're working with loud output levels. Having the signal spikes (kick drum, for instance) attenuated a bit can actually increase the apparent loudness of the overall mix without diminishing the "power" behind the spikes. It is also a useful protection device for those unexpected moments, such as the lead singer actually hitting the right note, a mike stand or the drummer falling over, dropping the tone arm, or an attack of killer feedback.



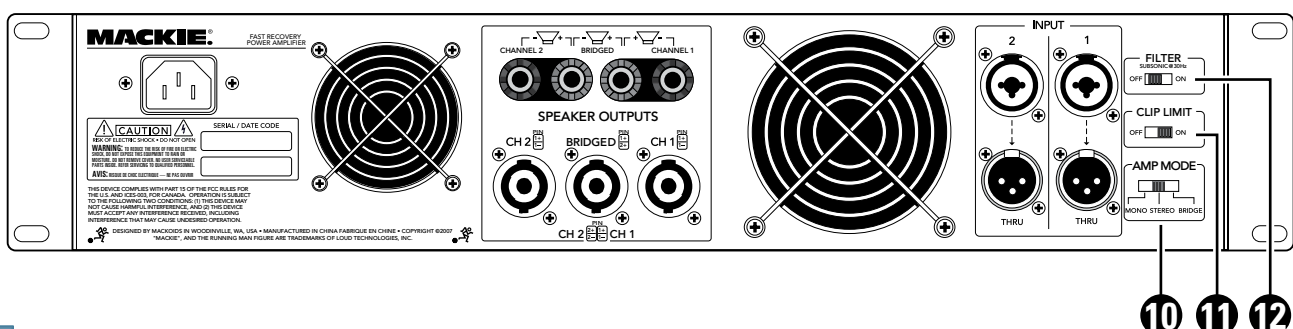
With the limiter engaged, you can still overdrive the amplifier into clipping and cause distortion. It just takes a stronger signal to do it. So even with the limiter turned on, you must pay attention to the OL LEDs.

12. SUBSONIC FILTER

Turn this switch on to engage a low-frequency cutoff (high-pass) filter at 30 Hz. The frequency range below 30 Hz is attenuated.

The amplifiers can amplify signals below 20 Hz, but most speakers can't reproduce frequencies that low. By engaging the subsonic filter, you allow the amplifier to power only the frequencies you can hear. In addition, this filter can reduce low-frequency stage noise (footsteps) and accidental microphone pops that could damage a loudspeaker.

Leave this off if your amplifier is powering a subwoofer, or if your speakers can reproduce low frequencies such as the kick drum range.



General Precautions

AC POWER REQUIREMENTS

The amplifier's power cord should be plugged into an AC outlet properly configured with the voltage required for your particular model.

Be sure the AC outlet can supply enough current to allow full power operation of all the amplifiers plugged into it. The outlet should be a three-prong socket that matches the power cord.



WARNING: Bypassing the plug's safety ground pin can be dangerous. Don't do it!

The AC current demand of an amplifier varies depending on several factors, including the load impedance, the crest factor, and the duty cycle of the program material. Under typical conditions reproducing rock music where musical peaks are just below clipping, the amplifiers require the following average currents:

FRS•1300 = 6 A

FRS•1700 = 8 A

FRS•2800 = 11 A

It is recommended that a stiff supply of AC power be used because the amplifier places high current demands on the AC line. The more power that is available on the line, the louder the amplifier will play and the more peak output power will be available for cleaner, punchier bass.

If you have more than one amplifier sharing an AC outlet, you should avoid turning them all on at the same time. Rather, sequence them on, one at a time, to prevent popping the circuit breaker (due to in-rush current).

THERMAL CONSIDERATIONS

The power amplifier is fan cooled. Air is drawn through the rear panel vents, to cool down the amplifier heatsinks, and then expelled through the front panel vents.

When installing, be sure to allow sufficient air space around the front and rear of the amplifier for adequate cooling for the heatsinks. Leave at least one rack space above and below, and at least 6 inches behind and in front of the chassis to allow proper ventilation.

If the amplifier should overheat, a thermal switch turns off the power amplifier, allowing the heatsink to cool down. Once the amplifier has cooled to a safe operating temperature, the thermal switch resets and reactivates the amplifier. If this should occur, identify the cause of the problem and take corrective action. For example:

- Provide better ventilation
- Install a fan in the rack to move more air
- Make sure the amplifier is not overloaded with too low of a load impedance or by a short circuit on the speaker line

RACK MOUNTING

The FRS amplifiers are designed to be mounted in a standard 19 inch rack. They require two rack spaces (2U = 3.5"). They also require 14.65" depth inside the rack, including the rear support brackets. When designing your rack, put the heavier items at the bottom and the lighter items toward the top.

Secure the front panel of the amplifier to the front of the rack using four screws with soft washers to prevent scratching the panel. In addition, because of the weight of the amplifier, you must secure the rear support brackets of the amplifier to the back of the rack. You could use a support rail or shelf across the back of the rack, or angle brackets attached between the rear support rails and the rear rails of the rack. This is recommended for all components mounted in a rack that is going to be moved frequently.

MAINTENANCE

Usually, your amplifier will not require regular maintenance for normal use. However, you can do several things to keep it in good operating and cosmetic condition.

- **Testing:** Periodically test your system for proper performance. A simple test is to play a CD through it using well-defined, articulate, wide-range program material. Listen to ensure all drivers are working properly and for any evidence of distortion or other extraneous sounds. Test at several volume levels: very low, normal, and high.
- **Cleaning:** Use only a clean dry cloth to dust off and clean the surface. Turn off the power to the amplifier while you do this.

Appendix A: Service Information

If you think your Mackie product has a problem, please check out the following troubleshooting tips and do your best to confirm the problem. Visit the Support section of our website (www.mackie.com/support) where you will find lots of useful information such as FAQs, documentation, and user forums. You may find the answer to the problem without having to send your Mackie product away.

Troubleshooting

No Power

- Our favorite question: Is it plugged in?
- Make sure the power cord is securely seated in the IEC socket and plugged all the way into the AC outlet.
- Make sure the AC outlet is live (check with a tester or lamp).
- Make sure the front panel power switch is in the on position.
- Is anything on the front panel illuminated? If not, make sure the AC outlet is live.
- Are all the lights out in your town? If so, contact your local power company to get power restored.
- If nothing is illuminated, and you are certain that the AC outlet is live, it will be necessary to have your amplifier serviced. *There are no user serviceable parts inside.* Refer to “Repair” on the next page to find out how to proceed.

No Sound or Low Output

- Loudspeaker cables or connectors are not wired correctly or they are faulty. Check all cabling, referring to these instructions for the correct connections. The best way to check a suspect cable is to swap it with a known good cable. Read the loudspeaker’s input panel to verify correct cable connections.
- Loudspeaker is not working. Connect the loudspeaker cable to a known good loudspeaker leaving all equipment set to the same levels. If the problem disappears, the loudspeaker is probably not working correctly.
- Are the channel level controls turned up? Slowly turn them up and see if you hear anything.
- Is the signal source turned up? Make sure the signal level from the mixing console (or whatever device immediately precedes the amplifier) is high enough to produce sound in

the amplifier. The SIG LEDs should be blinking to indicate that signal is present.

- If the speakers are wired for bridge mode, make sure the amp mode switch is set to bridge.
- If the amplifier has become extremely hot, the thermal protection circuit may have activated. Allow the amplifier to cool down and normal operation should resume.
- Are there fuses in the speakers, or in-line fuses in the speaker wire? Check to see if they’re blown.

Distorted Sound

- The power amplifier is clipping. The signal level is exceeding the limits of your system and you must reduce the level from your mixer or signal source.
- Ensure that no equipment in the signal chain is being over driven. For example: input(s) or summing bus in the mixing console, equalizers etc.
- Is the input connector plugged completely into the jack? Check the speaker connections and verify that all connections are tight and that there are no stray strands of wire shorting across the speaker terminals.
- If possible, listen to the signal source with headphones plugged into the console. If it sounds bad there, the problem is not in the amplifier.
- Loudspeakers not working properly.

Partial Sound (frequency band missing)

- Incorrect EQ settings in the electronic equipment. Ensure all EQ settings and filters on the mixing console or preamplifier and on other equipment are set for normal operation. Ensure level controls on electronic crossovers and associated amplifiers are correctly set and that all cables and connections for such equipment are connected and working properly.
- Loudspeaker not working properly. Swap with a good one.
- The fuses inside the amplifier may have blown. These are not a user-serviceable. See next page about service.

One side is louder than the other

- Are both level controls set to the same position?
- Check your source signal to make sure the left and right signals are balanced.
- Are the speaker impedances matched? Different speaker loads can cause different volume levels on each side.
- Try switching sides: Turn off the amp, swap the speaker cables at the amp, turn the amp back on. If the same side is still louder, the problem is with your speaker cabling. If the other side is louder now, the problem is with the mixer, the amp, or the line-level cabling.

Poor Bass response

- Check the polarity of the speaker cable connections. You may have your positive and negative reversed at one end of one speaker cable.

As the music gets loud, the amp shuts down

- Make sure the OL LEDs are not lighting continuously. If so, turn down the signal source or the amp level controls.
- Can the amp breathe? It needs plenty of fresh air to stay cool. **Do not block the ventilation holes.**

Noise/Hum

- Check the signal cable between the mixer and the amplifier. Make sure all connections are good and sound.
- Make sure the signal cable is not routed near AC cables, power transformers, or other EMI-inducing devices.
- Is there a light dimmer or other SCR-based device on the same AC circuit as the amplifier? Use an AC line filter, or plug the amplifier into a different AC circuit.
- If possible, listen to the signal source with headphones plugged into the console. If it sounds noisy there, the problem is not in the amplifier.
- Is there a cable-TV audio feed in your system? An incorrect ground may cause a "ground loop" hum.
- Sometimes it helps to plug all the audio equipment into the same AC circuit so they share a common ground.

Repair

For warranty repair or replacement, refer to the warranty information on page 19.

Non-warranty repair for Mackie products is available at a factory-authorized service center. To locate your nearest service center, visit www.mackie.com, click "Support" and select "Locate a Service Center." Service for Mackie products living outside the United States can be obtained through local dealers or distributors.

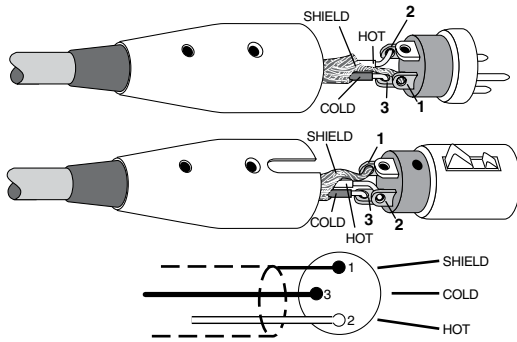
If you do not have access to our website, you can call our Tech Support department at 1-800-898-3211, Monday-Friday, 7 am to 5 pm Pacific Time, to explain the problem. Tech Support will tell you where the nearest factory-authorized service center is located in your area.

Appendix B: Connections, math and stuff

Use a high-quality 3-conductor shielded cable to connect the signal between the signal source (mixing console, equalizer, etc.) and the balanced inputs to the amplifier. If you are using unbalanced inputs, use a high-quality 2-conductor shielded cable. Here are some common audio connectors and their internal wiring:

XLR Connectors

XLR connectors are commonly wired as follows (according to standards specified by the Audio Engineering Society):

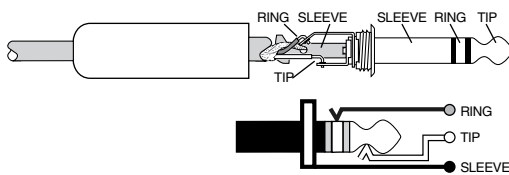


XLR Balanced Wiring

- Pin 1 = Shield
- Pin 2 = Hot (+)
- Pin 3 = Cold (-)

1/4" TRS Phone Plugs and Jacks

"TRS" stands for Tip-Ring-Sleeve, the three connections available on a stereo 1/4" or balanced phone jack or plug. TRS jacks and plugs are used for balanced signals and stereo headphones.

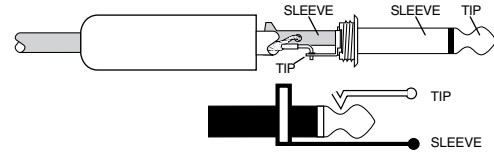


1/4" TRS Balanced wiring

- Sleeve = Shield
- Tip = Hot (+)
- Ring = Cold (-)

1/4" TS Phone Plugs and Jacks

"TS" stands for Tip-Sleeve, the two connections available on a mono 1/4" phone jack or plug. They are used for unbalanced signals.

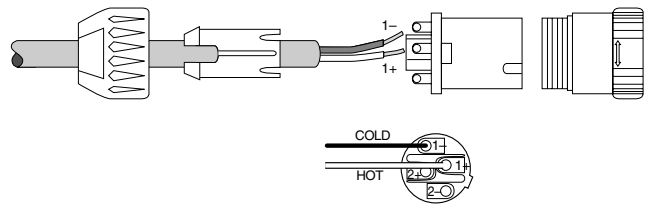


1/4" TS Unbalanced Wiring

- Sleeve = Shield
- Tip = Hot (+)

Speakons

When using the Speakon outputs in stereo or mono modes, wire the Speakon connectors as shown below:



Stereo and Mono Speakon Connection

Loudspeaker Cable

Use loudspeaker cables with a minimum conductor size for the length you need, as listed in these tables.

This will minimize power losses to less than 0.5 dB. The cable lengths listed are "up to" lengths. For in-between lengths, use the next larger conductor gauge.

Using larger than the recommended conductor size is always permissible. Using smaller than recommended conductor size will result in higher power losses.

Minimum AWG	4 ohm	8 ohm
18	10 ft	25 ft
16	25	50
14	25	75
12	50	125
10	100	200

Min Metric WG	4 ohm	8 ohm
12	3 m	8 m
14	8	15
16	8	25
20	15	40
25	30	60

The recommended conductor gauges are listed for AWG (American Wire Gauge) and Metric WG (Metric Wire Gauge). Note that smaller AWG numbers = larger

conductors and smaller Metric WG numbers = smaller conductors. The Metric WG is equal to ten times the nominal conductor diameter in millimeters.

Longer Lengths

For cable lengths over 200 feet / 60 m at 8 ohms, and over 100 feet / 30 m at 4 ohms, the conductor sizes needed for less than 0.5 dB power losses are rarely practical for physical and cost reasons.

As a practical compromise for these situations the recommended conductor gauge is 10 AWG or 25 metric.

Speaker Impedances

A speaker's impedance varies with frequency. For example, it may be 4 ohms at 500 Hz, and 6 ohms at 120 Hz. What you need to know is the average (or nominal) impedance across the speaker's frequency range. This will be printed somewhere on the cabinet, or in the specification section of the missing manual.

If you're just dealing with one speaker per channel, then make sure that the average impedance is greater than or equal to 2 ohms.

In bridged-mono mode, make sure that your speaker impedance is greater than or equal to 4 ohms.

If you're driving an assortment of speakers, you have to make sure that the total impedance does not go below these same levels. There are two basic ways of linking multiple speakers: series and parallel. The following sections show how to make the connections and how to work out the total impedance:

Series

"Series" means that the positive amp output connects to the first speaker's positive terminal, the first speaker's negative terminal connects to the second speaker's positive terminal, the second speaker's negative terminal goes to the amp's negative output. Series connections are not normally used in PA applications because it ruins the amplifier's ability to damp (control) the speakers. The other snag: if one speaker goes out, they all do. The audience may not appreciate this, and things could get ugly fast.

Doing load calculations with series configurations is easy — just add the loads. For instance, two 4-ohm speakers in series, equals 8 ohms ($4 + 4 = 8$).

Parallel

"Parallel" means that the positive amp output connects to the positive terminals of all the speakers, and the negative amp output connects to the negative terminals of all the speakers. If one speaker opens in a parallel configuration, the others will still work, but the load will change. That lets you breathe a little easier (the show will go on), except that you may have a dead speaker and not even know it.

Calculating parallel loads is also easy, as long as each speaker has the same value — just divide the value by the number of speakers.

For example, four 8-ohm speakers, connected in parallel, will equal 2 ohms ($8 / 4 = 2$).

If the parallel loads aren't all the same, things gets a little more complicated, but nothing that you can't do with a simple calculator. The total impedance (Z_T) is given by the following formula, where Z_1 , Z_2 and Z_3 are the impedances of your speakers.

$$Z_T = \frac{1}{\frac{1}{Z_1} + \frac{1}{Z_2} + \frac{1}{Z_3} + \dots}$$

There are other, more complicated configurations, like series-parallel (using a combination of series and parallel links to arrive at a desired load) and parallel configurations of unmatched loads (usually not recommended). But rather than get too deep into this, let's just summarize the basics, as they apply to you and your amp:

- The lower the speaker impedance, the more power can be put out by the amplifier.
- Driving lower impedance speakers makes the amplifier work harder and heat up quicker.
- Do not connect a total impedance of under 2 ohms per channel in stereo and mono modes.
- Do not connect a total impedance of under 4 ohms in bridged mono mode.
- Connecting speakers in series or parallel can drastically alter their frequency response.
- Consider using multiple amplifiers rather than overloading one.
- Reduce the low-frequency output by engaging the low cut filter.
- Never plug the amplifier outputs into anything except speakers (unless you have an outboard box designed to accept speaker-level levels).
- Be careful in bridged mono mode, as both speaker wires are live. In this mode, do not connect the speaker wires to any external device which is grounded.

Appendix C: Technical Info

Specifications

Continuous Sine Wave Average Output Power, per channel, both channels driven, 20 Hz to 20 kHz

	FRS•1300	FRS•1700	FRS•2800
2 ohms:	650 W	830 W	1300 W
4 ohms:	420 W	540 W	850 W
8 ohms:	235 W	310 W	500 W

Bridged Mono Operation, 20 Hz to 20 kHz

	FRS•1300	FRS•1700	FRS•2800
4 ohms:	1300 W	1660 W	2800 W
8 ohms:	840 W	1080 W	1700 W

Note: Power ratings are specified at 240 VAC line voltage.

Power Bandwidth

5 Hz to 50 kHz (+0, -3 dB)

Frequency Response

20 Hz to 25 kHz (+0, -1 dB)

Distortion

THD and SMPTE IMD; 20 Hz to 20 kHz
< 0.03 % @ 8 ohms

Signal-to-Noise Ratio

> 105 dB below rated power into 4 ohms

Channel Separation

> 68 dB @ 1 kHz

Damping Factor

> 300 @ 1 kHz and below, into 8 ohms

Input Impedance

20 k Ω balanced
10 k Ω unbalanced

Input Sensitivity

1.15 V (+3.4 dBu) for rated power into 4 ohms

Gain

FRS•1300:	32 dB
FRS•1700:	33 dB
FRS•2800:	35 dB

Maximum Input Level

9.75 Vrms (+22 dBu)

Turn On Delay

2.5 seconds

Subsonic Filter

- 9 dB @ 30 Hz

Topology

FRS•1300, FRS•1700: Class AB
FRS•2800: Class H

Cooling

Variable-speed fans with back-to-front airflow

Indicators

SIG (Signal Present) on each channel
OL (Overload) on each channel
Signal Meters -3 dB, -6 dB, -9 dB, -20 dB on each channel
Power LED on power switch

Current Consumption (measured at 240 VAC line voltage)

	FRS•1300	FRS•1700	FRS•2800
Idle	0.4 A	0.5 A	0.6 A
Musical Program:			
@ 8 ohms	4.0 A	5.3 A	8.4 A
@ 4 ohms	6.0 A	7.4 A	10.8 A
@ 2 ohms	8.2 A	11.4 A	18.3 A

AC Power Requirements

U.S. model: 100–120 VAC, 50–60 Hz
European model: 200–240 VAC, 50–60 Hz

Physical Dimensions and Weight

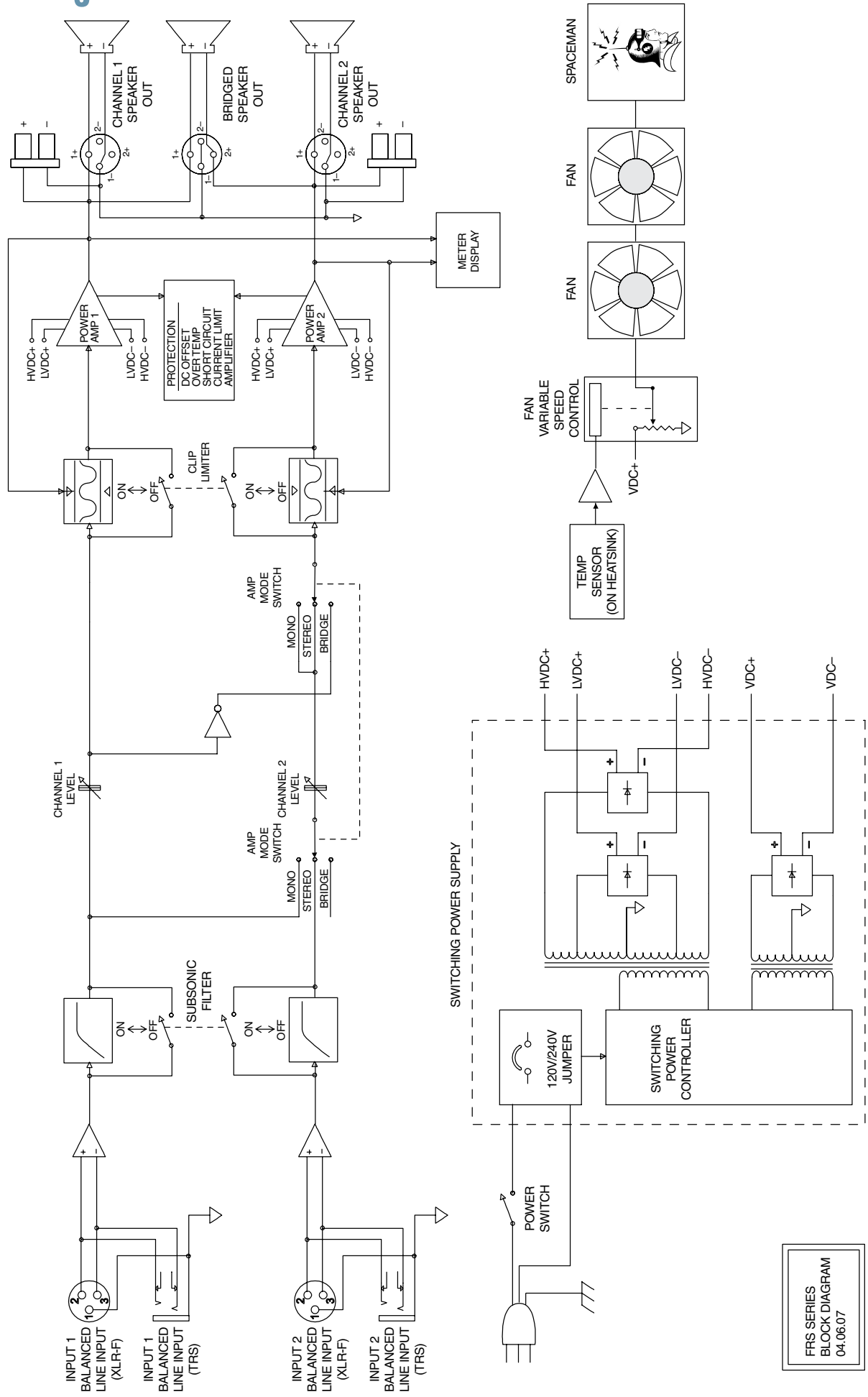
Height:	3.50 in/ 89 mm
Width:	19.00 in/ 483 mm
Depth:	14.65 in/ 372 mm
Depth with Handles:	16.15 in/ 410 mm
Weight:	
FRS•1300:	21.0 lb./ 9.5 kg
FRS•1700:	21.5 lb./ 9.7 kg
FRS•2800:	22.0 lb./ 10.0 kg
Flavor:	Slightly minty

LOUD Technologies Inc. is always boldly striving to improve our products by incorporating new and improved materials, components, and manufacturing methods. Therefore, we reserve the right to change these specifications at any time without notice.

“Mackie,” and the “Running Man” are registered trademarks of LOUD Technologies Inc. All other brand names mentioned are trademarks or registered trademarks of their respective holders, and are hereby acknowledged.

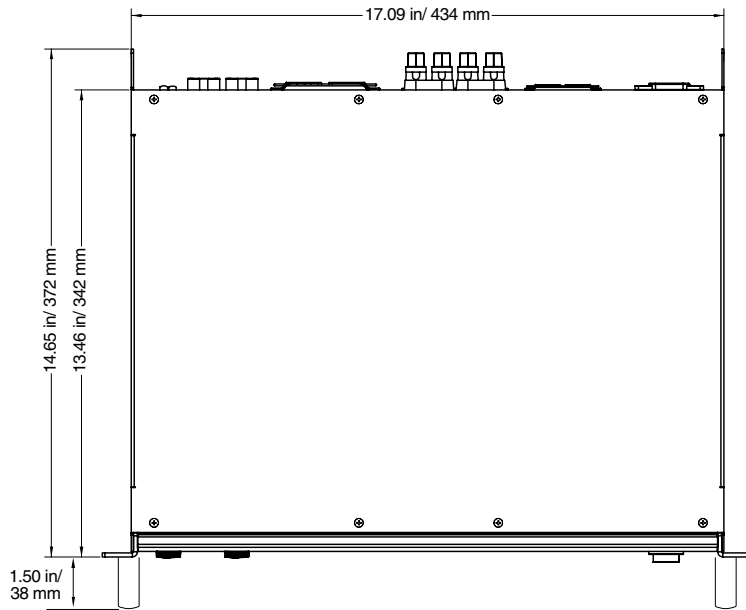
©2007-2008 LOUD Technologies Inc. All Rights Reserved.

Block Diagram



FRS SERIES
BLOCK DIAGRAM
04.06.07

Dimensions



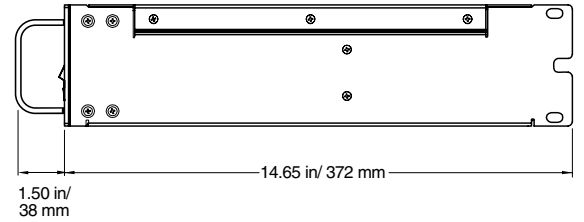
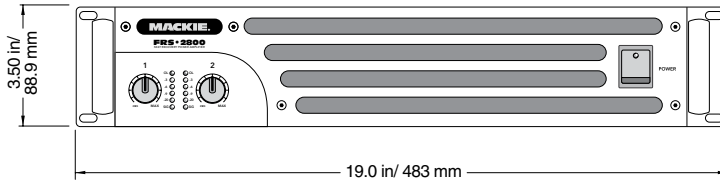
FRS-1300
WEIGHT
21 lbs.
(9.5 kg)



FRS-1700
WEIGHT
21.5 lbs.
(9.7 kg)



FRS-2800
WEIGHT
22 lbs.
(10 kg)



FRS Series Amplifiers Limited Warranty

Please keep your sales receipt in a safe place.

A. LOUD Technologies Inc. warrants all materials, workmanship and proper operation of this product for a period of **three years** from the original date of purchase. You may purchase an additional 24-month Extended Warranty (for a total of 60 months of coverage). Visit our website and follow the "Product Registration" links for details (www.mackie.com). If any defects are found in the materials or workmanship or if the product fails to function properly during the applicable warranty period, LOUD Technologies, at its option, will repair or replace the product. **This warranty applies only to equipment sold and delivered within the U.S. and Canada by LOUD Technologies Inc. or its authorized dealers.**

B. For faster processing (not to mention a free gift), register online or mail in the product registration card.

C. Unauthorized service, repairs, or modification of Mackie products will void this warranty. To obtain repairs or replacement under warranty, you must have a copy of your sales receipt from the authorized Mackie dealer where you purchased the product. It is necessary to establish purchase date and determine whether your Mackie product is within the warranty period.

D. To obtain warranty repair or replacement:

1. Call Mackie Technical Support at 800/898-3211, 7 AM to 5 PM Monday through Friday (Pacific Time) to get authorization for repair or replacement. Alternately, go to the Mackie website, click "Support" (www.mackie.com/support), and follow the instructions for reporting a warranty issue and submitting a request for an advance replacement.

2. Advance Replacement: Mackie will ship a replacement unit to you along with an invoice for the suggested retail price of the replacement unit. You must return the defective unit immediately to cancel the invoice. If you do not return the defective unit within 30 days, you must pay the full amount stated in the invoice to satisfy your debt.

3. Repair: When you call Mackie Technical Support, explain the problem and obtain a Service Request Number. Have your Mackie product's serial number ready. **You must have a Service Request Number before you can obtain factory-authorized service.**

- Pack the product in its original shipping carton. Also include a note explaining exactly how to duplicate the problem, a copy of the sales receipt with price and date showing, your daytime phone number and return street address (no P.O. boxes or route numbers, please!), and the Service Request Number. If we cannot duplicate the problem or establish the starting date of your Limited Warranty, we may, at our option, charge for service time and parts.

- Ship the product in its original shipping carton, **freight prepaid** to the authorized service center. Write the Service Request Number in **BIG PRINT** on top of the box. The address of your closest authorized service center will be given to you by Technical Support, or it may be obtained from our website. Once it's repaired, the authorized service center will ship it back by ground shipping, pre-paid (if it qualified as a warranty repair).

Note: Under the terms of the warranty, you must ship or drop-off the unit to an authorized service center. The return ground shipment is covered for those units deemed by us to be under warranty.

Note: You must have a sales receipt from an authorized Mackie dealer for your unit to be considered for warranty repair.

IMPORTANT: Make sure that the Service Request Number is plainly written on the shipping carton. No receipt, no warranty service.

E. LOUD Technologies reserves the right to inspect any products that may be the subject of any warranty claims before repair or replacement is carried out. LOUD Technologies may, at our option, require proof of the original date of purchase in the form of a dated copy of the original dealer's invoice or sales receipt. Final determination of warranty coverage lies solely with LOUD Technologies.

F. Any products returned to one of the LOUD Technologies factory-authorized service centers, and deemed eligible for repair or replacement under the terms of this warranty will be repaired or replaced. LOUD Technologies and its authorized service centers may use refurbished parts for repair or replacement of any product. Products returned to LOUD Technologies that do not meet the terms of this Warranty will not be repaired unless payment is received for labor, materials, return freight, and insurance. Products repaired under warranty will be returned freight prepaid by LOUD Technologies to any location within the boundaries of the USA or Canada.

G. LOUD Technologies warrants all repairs performed for 90 days or for the remainder of the warranty period. This warranty does not extend to damage resulting from improper installation, misuse, neglect or abuse, or to exterior appearance. This warranty is recognized only if the inspection seals and serial number on the unit have not been defaced or removed.

H. LOUD Technologies assumes no responsibility for the timeliness of repairs performed by an authorized service center.

I. This warranty is extended to the original purchaser. This warranty may be transferred to anyone who may subsequently purchase this product within the applicable warranty period for a nominal fee. A copy of the original sales receipt is required to obtain warranty repairs or replacement.

J. This is your sole warranty. LOUD Technologies does not authorize any third party, including any dealer or sales representative, to assume any liability on behalf of LOUD Technologies or to make any warranty for LOUD Technologies Inc.

K. THE WARRANTY GIVEN ON THIS PAGE IS THE SOLE WARRANTY GIVEN BY LOUD TECHNOLOGIES INC. AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE WARRANTY GIVEN ON THIS PAGE SHALL BE STRICTLY LIMITED IN DURATION TO THREE YEARS FROM THE DATE OF ORIGINAL PURCHASE FROM AN AUTHORIZED MACKIE DEALER. UPON EXPIRATION OF THE APPLICABLE WARRANTY PERIOD, LOUD TECHNOLOGIES INC. SHALL HAVE NO FURTHER WARRANTY OBLIGATION OF ANY KIND. LOUD TECHNOLOGIES INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES THAT MAY RESULT FROM ANY DEFECT IN THE MACKIE PRODUCT OR ANY WARRANTY CLAIM. Some states do not allow exclusion or limitation of incidental, special, or consequential damages or a limitation on how long warranties last, so some of the above limitations and exclusions may not apply to you. This warranty provides specific legal rights and you may have other rights which vary from state to state.

MACKIE®

16220 Wood-Red Road NE • Woodinville, WA 98072 • USA

United States and Canada: 800.898.3211

Europe, Asia, Central and South America: 425.487.4333

Middle East and Africa: 31.20.654.4000

Fax: 425.487.4337 • www.mackie.com

E-mail: sales@mackie.com