Project 13: AC-Powered Practice Amp

If you want to amplify your guitar backstage for tuning, practice in a hotel room, or just make peace with neighbours

who don't appreciate your Marshall stack, this is the project for you.

Battery-powered practice amps can produce only so much power; trying to shove out lots of watts means having to shove in lots of batteries and with today's battery costs, the expense becomes prohibitive. For applications where you need a bit more oomph, this AC-powered design does the job. It doesn't exactly deliver ear-shattering volume, but it does give a good clean sound at comfortable listening levels.

About the Circuit

This circuit is based around National Semiconductor's LM383 power amp IC, which can put out up to 8 watts. The actual amount of power depends upon what kind of speaker and power supply you use (or as they always say, "your mileage may vary . . ."). All other parts for the circuit are common, and should be available from Radio Shack and most mail-order electronics outfits.

Construction

The amp (Fig. 5-7) can be built in just about any type of suitable enclosure; you can even build the thing inside the speaker baffle that contains Spkr1. If you expect to use the practice amp

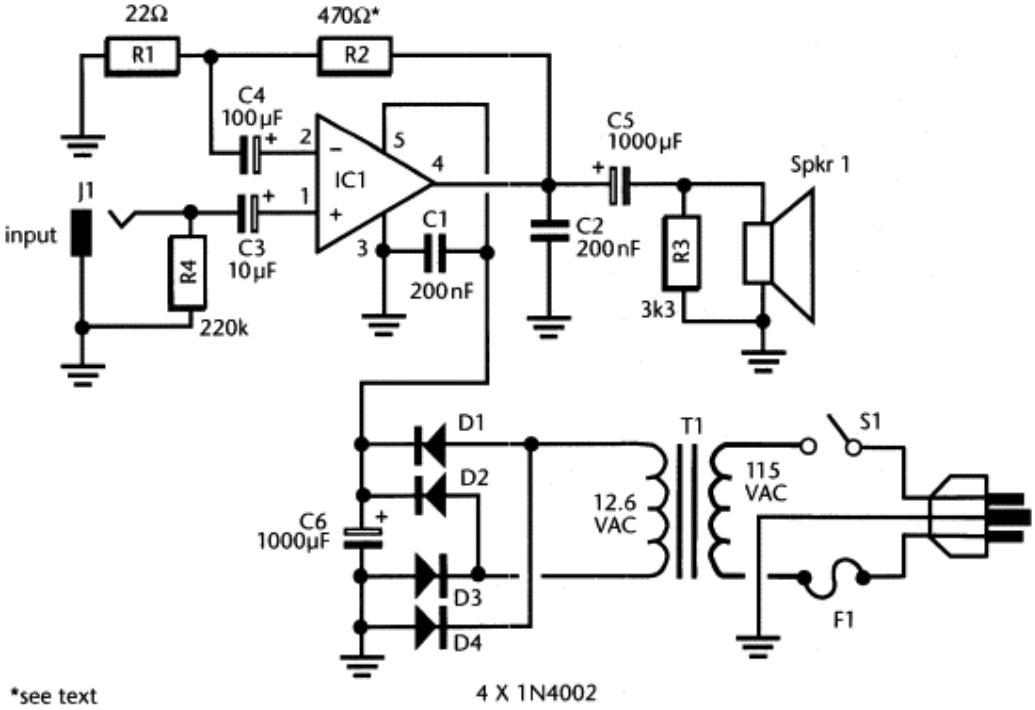

Fig. 5-7

AC Practice Amp schematic.

with a number of different speakers, then build the amp inside a separate box and include a phone jack or similar connector to allow plugging in to the speaker of your choice.

There are a few cautions concerning this design. Since this is a relatively high power, high gain circuit, you have to be pretty careful about grounding and how you route the input and output leads. For best results, observe the following precautions:

Build the amp inside a metal (aluminium preferred) case.

Separate the input and output leads to avoid oscillation.

Use a single point grounding system, where all grounds connect to one place. That one place should be the (-) end of capacitor C6, which also connects to chassis ground.

Attach the LM383 to a heat sink. Since the LM383 case is at ground potential, you can simply attach it to the metal chassis and let the chassis conduct heat away from the IC. If you do not attach the LM383 to the chassis, then you should add a separate heat sink. By the way, the LM383 is short circuit and thermal overload protected, so if it ends up running too hot, it won't blow up but instead will shut down until it has a chance to cool off.

Mount C1 close to the IC pins. This bypasses the power supply, which discourages oscillation and similar problems.

Use a fuse in the AC supply leads as shown. This should be a 1/4A to 1/2A, fast-blow type.

And now, for the standard don't-kill-yourself disclaimer: *BE CAREFUL WHEN WORKING WITH AC VOLTAGES*

SINCE THEY CAN BE LETHAL! Securely attach the AC line cord leads and the leads from the transformer primary to the fuse holder and S1. Also make sure that all AC connections are well away from the chassis and insulated (heat shrink tubing is best, since electrical tape may unravel over time); it's possible that someone could accidentally step on the amp chassis and cause a short circuit by shorting the case to the wiring. Although the fuse gives a certain amount of protection, it's important to always build anything that uses AC with an eye toward safety. *If you have any doubts whatsoever about your ability to complete this project, or are unfamiliar with proper AC power construction techniques, do not attempt to build this amp.*

Speaker and Power Supply

You have a couple of choices for Spkr1. The higher its impedance, the less power you'll get out of the circuit. A 4Ω speaker (or two paralleled 8Ω speakers) will work just fine; an 8Ω speaker is okay, but won't give you as much output.

You can even parallel two 4Ω speakers for a total load of 2Ω. This gives the highest potential wattage.

While AC power is preferable for an amp like this, you can also run it from something like a 12-volt car battery or other heavy-duty DC power source (two 6-volt lantern batteries, for example). In this case, omit D2-D4; connect the battery's positive terminal to D1's cathode and the negative terminal to ground.

Using the Practice Amp

The procedure is pretty straightforward: plug in and if the thing doesn't work, check for errors. If you get distortion, though, you may need to change R2. It's shown as 470Ω, which gives a fair amount of gain and therefore lets you feed the amp directly with low level output instruments such as guitar. If you have an axe with on-board electronics or something else that generates a lot of output, then change R2 to around 270 or 220Ω.

Now all that remains is to . . . start practicing!

PARTS LIST

Resistors (1/4 watt, 5% or 10% tolerance)
R1 22Ω
R2 220Ω to 470Ω (see text)
R3 3.3k (3k3)
R4 220k
Capacitors (20 or more working volts)
C1, C2 0.22µF (220nF) ceramic or mylar
C3 10µF electrolytic or tantalum
C4 100µF electrolytic
C5, C6 1000µF electrolytic
Semiconductors
D1-D4 1N4002 or equivalent power diode
IC1 LM383 (National Semiconductor) power amp IC
Other parts
T1 115 VAC primary, 12.6 VAC secondary @ 1A transformer
S1 SPST on-off switch rated at 125V minimum
F1 1/4 or 1/2A fast-blow fuse
J1 Mono, open circuit, 1/4" phone jack
SPKR1 2Ω to 8Ω speaker (see text)
Misc. AC line cord, chassis, solder, wire, fuse holder, screws, etc.