Subject: IR Remote Control
Posted by skywave-rider on Fri, 25 May 2012 20:46:56 GMT
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from the LSAF 2012 thread:

Wayne Parham wrote on Sat, 24 September 2011 01:38It's not expensive. The remote control itself is a generic universal - just get any one you like. I prefer those that have the up/down and left/right buttons prominent, as opposed to the remotes that have vertically arrayed channel up/down and volume up/down. But any of them will work. Then there's the control board. I'd say by the time the boards are etched and deals are struck, it's probably going to be less than a hundred bucks for the completed control board.

Having said that, it's all still preliminary. The design is done, prototype is working. I can burn chips right now, and can probably have boards etched in less than a month. But I do need to figure out pricing and delivery model. I don't know if I'll make them available directly or just through OEMs. I have plenty of friends in the business that manufacture amps, preamps and kits, so it might make sense to make it available to them, and let them brand them and resell them. I need to work through all that first. Still, by LSAF, the business side should all be worked out.

Wayne, I'm not up to speed on this yet, but it's exactly what I want to be the potentiometer (with or without remote) for my unbuilt preamp. (PASS hotrodded B1.)

Tell me you are making boards and kits...............?

Subject: Re: IR Remote Control
Posted by Wayne Parham on Fri, 25 May 2012 23:49:32 GMT
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I actually wrote the firmware for the microcontroller on request of a friend and fellow kit maker. I realized there were a lot of amp kit makers and DIYers using remotes that were cheaply made. A motorized pot is not an improvement, except in terms of convenience. In most cases, they are a step back in sound quality because the pot used is el-cheapo. So this is a way to get convenience and high fidelity quality sound on a budget.

I am not planing to make boards and kits, because I want to leave that to the amp makers. However, it isn't hard at all to do. All the "circuitry" is in the firmware - the external circuit is literally just a three-wire interface between processor and RDAC, a single wire from the IR receiver and a power supply. It's super-simple to build one of these things. More wiring for the audio lines than anything else.

So you can wire one up with point to point wiring in minutes. You'll spend more time making the box and hooking up the RCA connectors than you will building the circuit. Most times, you'll want some nice relays for a switcher - to switch sources - and that's a little more circuitry, but still easy,

just a garden variety 2N2222 transistor and a relay. Probably want some LEDs too, one for power, maybe one on each source line (same one that is connected to the relay/transistor) to show which source is selected.

Power supply is split, +/-2.5v. Easy enough to do with a couple of LM317/LM337 regulators. The schematic below shows a supply that is probably overkill, having cascaded regulators (7805/7905 followed by LM337/LM317) for extra noise immunity. This level of regulation rivals battery power for noise rejection.

But a complex supply isn't really needed. It could even be done with 1N5222 zeners in series with resistors on each end. The center is ground, and zeners on each side give +/-2.5v. Resistors of appropriate values to limit current, e.g. 22 ohms per side for a 12v supply. So, for example, if you have a 12v DC supply, hook one side of a 22 ohm, 10 watt resistor to the 12v (+) line, the other size to the cathode (band) of an 1N5222 zener, then connect the anode of that first zener to the cathode of a second 1N5222, then the anode of the second zener goes to a second 22 ohm, 10 watt resistor, and finally the other side of that second resistor goes to the (-) line of the 12v supply. Put 10uF capacitors across the zeners, and they provide the +/-2.5v across them. The connection between the zeners is ground, and the connection between the zeners and their resistors is the +/-2.5 outputs.

Use the split supply only to power up the processor and RDAC chips. Wire the relays and any indicator LEDs directly to the 12v supply. They're controlled by outputs from the processor, but their power comes from the 12v line. That limits the current requirements through the zeners and keeps 'em constant.

I like using a stereo VU meter hooked to a couple of the unused RDACs to give a visual indication of the volume setting for each channel. There are six RDACs and only two are needed for the audio signal, so two of the others can be used to drive a volume display. Just wire it as a voltage divider on the power supply, so the wiper provides a voltage proprtional to the volume setting. A schematic for a simple indicator using an LM3916 is shown below. Gotta use blue LEDs, of course.

Remote Control Module Application Notes
Remote Control Circuitry and Assembly

Subject: Re: IR Remote Control

Posted by skywave-rider on Sun, 27 May 2012 20:39:54 GMT
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Thanks, Wayne. Putting together the parts order.
I will be utilizing this along with the Pass Hypnotize.

After reading your very complete info I will put together a separate supply so the IR remote can stand by without powering the entire Pre. I'll then run a relay to provide switched power for the rest, as your IC provides for.

I intend to duplicate all IR functions with momentary switches on the front panel, with indicator LEDs for channel and VUs.

If it all goes up in flames I promise to document it for entertainment purposes.

You know, this chip-set you designed nailed exactly what I have been trying to do with this preamp build. Uncanny. Fantastic. I hope I can get it together.

Thanks again.

Subject: Re: IR Remote Control
Posted by Wayne Parham on Mon, 28 May 2012 00:50:58 GMT
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I agree with you on the front-panel switches. I like to be able to control the device without needing the remote. That's what the BTN lines are for. All you need is a momentary push-button switch for each function. A momentary connection to V- triggers the line.

BTN_PWR is power switch
BTN_SEL selects source
BTN_UP is volume up
BTN_DN is volume down
BTN_LF is balance pan left
BTN_RT is balance pan right

Subject: Re: IR Remote Control
Posted by skywave-rider on Thu, 31 May 2012 18:52:14 GMT
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Wayne,
I have not gotten the IR receiver (4838) yet, but looking at your build, it appears that an approx. 1/2" hole is sufficient. I will size it when the order arrives, but I am wondering about mounting options for that. Spec sheet assumes circuit board mounting, but I may glue it to the front panel

and extend leads. Another option would be to mount it on a perfboard and line the face up with the hole in the panel. So I guess the question is, do you think it will have decent angle of acceptance butted up behind a 3/16" panel with a round hole?

Subject: Re: IR Remote Control
Posted by Wayne Parham on Thu, 31 May 2012 22:47:19 GMT
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It's a pretty good receiver, somewhat environment friendly. However, it is a line-of-site thing, so I would try to get the face as close to flush as possible.

Subject: Re: IR Remote Control
Posted by Bill Epstein on Tue, 05 Jun 2012 18:16:58 GMT
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Thanks Wayne.

Question: are you soldering to the pins direct (kinda scary) or should I get a receptacle of some sort? I looked at Digikey and all the chip sockets just have tails for PCBs like the chips themselves.

Do you know of a socket with solder lugs?

Subject: Re: IR Remote Control
Posted by Wayne Parham on Tue, 05 Jun 2012 20:19:47 GMT
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I would definitely socket the chips. Don't get the cheap little tin jobs either, get good gold plated sockets. You're right, they're designed to mount on a printed circuit board. Put it on a perfboard, and solder to the side with pads.

Subject: Re: IR Remote Control
Posted by Bill Epstein on Sun, 10 Jun 2012 11:36:00 GMT
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Got the Digikey package and I'm suspiciously eyeing the little bit of post that extends thru the

perfboard!

Gonna be tough to lasso those with solder, pardner.

Subject: Re: IR Remote Control
Posted by skywave-rider on Sun, 10 Jun 2012 14:26:18 GMT
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Bill, maybe you could use those IC perfboards that RS sells, or similar, which have solder traces and through holes. I am going to try to use those for the chips.
http://www.radioshack.com/product/index.jsp?productId=2102845

http://www.radioshack.com/product/index.jsp?productId=2103799

Subject: Re: IR Remote Control
Posted by Wayne Parham on Sun, 10 Jun 2012 14:53:40 GMT
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Yeah, those Radio Shack boards are great. Digikey has a bunch of various sized perfboards too.

Subject: Re: IR Remote Control
Posted by Bill Epstein on Sun, 10 Jun 2012 16:08:05 GMT
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The 417 hole board looks perfect, the other won't take the 24 pin pad. Great rec, thanks!

Subject: Re: IR Remote Control
Posted by skywave-rider on Sun, 10 Jun 2012 17:22:26 GMT
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Use one for the 20 pin, the other for the 24 (IIRC) and the extra holes are for cooling.

What IC holders did you get, Bill?
My order is from Mouser and I could not find gold plated sockets in stock.

Subject: Re: IR Remote Control
Posted by Bill Epstein on Sun, 10 Jun 2012 18:58:37 GMT
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Digikey 24 pin EDS6243-ND and 20 pin EDS6203-ND

Also the NPN which I hope is the right spec 497-2598-ND 40V 600mA TO-18

The relay Reed DPST 500mA 12V 306-1035-ND

I forgot to get an DC input jack but I can get that from rat Shack with the perf boards

What else do I need?

Subject: Re: IR Remote Control
Posted by skywave-rider on Mon, 11 Jun 2012 00:30:11 GMT
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Thanks, Bill. I'll post my bill of goods tomorrow.

Subject: Re: IR Remote Control
Posted by Wayne Parham on Mon, 11 Jun 2012 02:15:32 GMT
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Bill Epstein wrote on Sun, 10 June 2012 13:58Digikey 24 pin EDS6243-ND and 20 pin EDS6203-ND

Also the NPN which I hope is the right spec 497-2598-ND 40V 600mA TO-18

The relay Reed DPST 500mA 12V 306-1035-ND

I forgot to get an DC input jack but I can get that from rat Shack with the perf boards

What else do I need?
The relay, transistor and sockets are all correct.

Now you just need a power supply. I like using a center tapped 12V transformer, rectifier, filter cap, a 7809 and 7905 to make +/-5V then onto a 317 and 337 to make +/-2.5v. This is seriously overkill having two regulators. But each of the regulators is like sixty cents a piece, so having all that noise filtering is cheap.

Could do it with a rectifier, filter cap and a pair of Zeners. Or could go with the modules like Bruce did. But no matter how you slice it, you gotta have +/-2.5V.

Subject: Re: IR Remote Control
Posted by skywave-rider on Thu, 14 Jun 2012 23:02:38 GMT
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Sorry guys, I will try to post the stuff tonight.

Subject: Re: IR Remote Control
Posted by skywave-rider on Sat, 16 Jun 2012 23:52:32 GMT
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Here's my BOM minus the PS stuff because I took a different approach. I am not sure if the caps in the IR rcvr circuit (1.0/.1uF) should be polarized electrolytic. Wayne?

I made my order at Mouser. Bill, I could not find the parts using the numbers you supplied for the gold sockets at Digikey. Could you verify those?

Relays:
-NEC EA2-12NJ (signal relay) x5
-Omron G4W-2214P-US-HP-DC12 (switched power relay) x1
-220R x6
-2N222 x6
IR Receiver:
-TSOP 4838
-1.0uF
-.1uF
-220R
Display (LED Meter):
-LM3916 x2
-1.2KR x2
-7.5KR x2
-2.2uF tantalum x2
Momentary Switches:
-http://www.parts-express.com/pe/showdetl.cfm?Partnumber=060-622   x6

Subject: Re: IR Remote Control
Posted by Wayne Parham on Sun, 17 Jun 2012 02:26:00 GMT
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Those filter caps across the power line for the chips and IR module can be pretty much anything.

Electrolytic is fine.

Subject: Re: IR Remote Control
Posted by Bill Epstein on Sun, 17 Jun 2012 14:20:22 GMT
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20 pin = ed56203-nd
24 pin = ed56243-nd
relay reed 306-1035-nd
trans 497-2598-nd

they all check out, you have to place the dash before the nd where applicable

What are you doing about the power supply? That's what I'm hung up on...15 to 7.5 to 5 to 2.5 volts? Yikes! Can't begin with a 5 volt tranny?

Wayne, got parts for that?

Subject: Re: IR Remote Control
Posted by skywave-rider on Sun, 17 Jun 2012 16:11:20 GMT
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Thank you Wayne and thanks, Bill. I see the numbers do work, I must have typed them into the wrong search field.

Bill, in my setup I will use 12V and dual (+/-) 2.5V circuit which Wayne specified. The Remote Control Module chipset runs on the +/- 2.5, and the relays and LED display chips run on the 12V supply.

I see the relays you have selected run on 12V too.

If you want I can post or email a schematic of what I will do with the PS, but Wayne's suggestion has better regulation. My approach is very basic. I did it this way because I already ordered the transformer before I saw Wayne's suggestion.

Subject: Re: IR Remote Control
Posted by skywave-rider on Wed, 20 Jun 2012 21:49:47 GMT
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Got my DigiKey delivery today. So I think I have everything I need minus the chassis. I'll begin putting together sub assemblies and then I'll figure out how it will fit into the enclosure.

Subject: Re: IR Remote Control
Posted by Wayne Parham on Thu, 21 Jun 2012 00:12:14 GMT
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I'm building some prototypes too. I had intended to just develop the firmware and make the chips available to small amp and DIY kit manufacturers. Was really planning to leave it at that. But after hearing the initial prototype Bruce made around my "Blue" processor - the stereo version - I decided I wanted one of my own. Maybe a proud papa thing, but it's the best "preamp" I've ever owned. I sold all my other preamps, resistor passives, LDR passives, solid state actives and tube actives. Now I just run RDACs for volume control.

Bruce's proto works fine, but I want different displays and case. I also want to use a different power supply. So I bought some Metcase enclosures, perfboards and piece parts from Digikey. Hopefully, I can get them all together in a few weeks. Tough to do with a 5-year-old running around.

Subject: Re: IR Remote Control
Posted by skywave-rider on Thu, 21 Jun 2012 03:36:39 GMT
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I don't know how you can do all this stuff.

Subject: Re: IR Remote Control
Posted by gofar99 on Thu, 21 Jun 2012 18:31:46 GMT
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Hi Wayne, post photos when it gets done. Perhaps a schematic of the end result as well. Mine was really a "proof of concept" build so I expect yours to be top dog.

Subject: Re: IR Remote Control
Posted by Bill Epstein on Thu, 28 Jun 2012 10:53:39 GMT
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Wayne Parham wrote on Wed, 20 June 2012 20:12
  Maybe a proud papa thing, but it's the best "preamp" I've ever owned. I sold all my other preamps, resistor passives, LDR passives, solid state actives and tube actives. Now I just run RDACs for volume control.

Madness! No tubes? No mechanical switches? The horror!

Somewhere in the correspondence over the build and receiving packages from Digikey I was inspired to get the UPS damaged Aikido off the shelf and do the re-build. I drilled and painted the replacement chassis over 2 years ago and then forgot about it.

Now I just have to wire up the switch and attenuator and it's done. Then, with a little help on the power supply and layout from you guys, I'll do the RDAC and have a Rodeo.

Subject: Re: IR Remote Control
Posted by Wayne Parham on Fri, 31 Aug 2012 04:47:04 GMT
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I've been meaning to post for months now (literally). But I have been completely swamped with orders. My son is soldering all the boards he can, as am I, and we're still running about 4-6 weeks behind filling orders for loudspeakers and kits. So I've just plain-old had no time for hobby projects.

But I decided at the beginning of the summer to build four prototypes, one of the "red" (six-channel) processor and three of the "blue" (two-channel) processors. I'll keep one of the blues and the red, but I'll probably sell the other two blues. I'm putting them in nice Metcase enclosures, which are being punched and etched right now.

The photo above (click to enlarge) shows the prototype perf boards and one of the enclosures. I have only wired up the power supplies, and not the processor or RDAC. I chose a double-regulated supply, which is way overkill, but chips are cheap these days, so I figured it couldn't hurt. I'm using a 12VAC center-tapped transformer, which connects to the three wires you see hanging off the proto boards. This is rectified, then passed to a 7805/7905 to give +/-5VDC, and this is sent to a LM337/LM317 to give +/-2.5VDC. Overkill, but quiet.

I probably should have waited for Uriah to finish his printed circuit boards, because it would have made it easier to build than point-to-point wiring on a perf board. I think he has them in stock now. But I've built plenty of prototypes this way, over the years.

As an aside, I like working with Metcase and Pac-tec enclosures because the front and rear panels are just removable flat panels that are easy to punch, engrave or silkscreen. They're great for prototypes and small production runs, and cost effective even when doing a few thousand units. I've made thousands of "black boxes" like this, mostly communications and control devices.

Subject: Re: IR Remote Control
Posted by gofar99 on Fri, 31 Aug 2012 20:33:43 GMT
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Hi Wayne, Did you come up with a display for the units?

Subject: Re: IR Remote Control
Posted by Wayne Parham on Fri, 31 Aug 2012 21:19:54 GMT
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What I'm going to do is to use an LM3916 driving ten blue LEDs per side.

By the way, Bruce, I wanted to thank you again for building the first prototype using this chipset.
I'm still using it in my personal system.

Subject: Re: IR Remote Control
Posted by gofar99 on Sat, 01 Sep 2012 02:25:39 GMT
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Hi Wayne, my pleasure on the build.   A departure from tubes for a while and a learning
experience. I noticed you used the two stage regulators. I believe that was important in the one I
built as it made it quite stable and really quiet. The LM3916 is a good choice. They are
inexpensive and work well with LEDs. I have one of the LM39XX series that has a built in led bar
graph and wish I had more. They are scarce and last time I checked quite costly. I think the
original cost was something like $4. Now about 10 times that.

Subject: Re: IR Remote Control
Posted by Wayne Parham on Mon, 24 Sep 2012 06:06:02 GMT
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gofar99 wrote on Fri, 31 August 2012 21:25Hi Wayne, my pleasure on the build.   A departure
from tubes for a while and a learning experience. I noticed you used the two stage regulators. I
believe that was important in the one I built as it made it quite stable and really quiet. The

LM3916 is a good choice. They are inexpensive and work well with LEDs. I have one of the LM39XX series that has a built in led bar graph and wish I had more. They are scarce and last time I checked quite costly. I think the original cost was something like $4. Now about 10 times that.

I got LM3916 chips at DigiKey for about two bucks each.

LM3916 at DigiKeyI've put the IC sockets and relays on each of the four prototype boards. Going at a snails pace because I have so many more things on my plate. But it is a pretty simple circuit so I should have 'em done in the next few months, hopefully by the end of the year.

I'm using a little 5V relay that has excellent contacts and only takes 30mA holding current. So it's nothing for the regulators to drive:

IM03GR 5V DPDT relayThe metal shop should have the front and rear panels done this week, so I'll post pictures when I get them.

I got the front and rear panels back from the shop last week. If any of you want to follow in my footsteps, the shop has the drawings for these panels and I told them it was OK to sell panels from my drawings to anyone that asks. The front/rear panels fit the Metcase M55-02-119 box, available from Newark electronics and other vendors.

Each panel costs about $60 - $75 each, so a front and rear panel is around $120.00 - $150.00. Prices vary with quantity and number of punches, of course, so the "blue" processor panels are a little less expensive than the "red" because there is less machining required for the blue panels.

You can drill your own, of course, but if you have the money it's nice because all the holes are uniformly spaced and exactly the right size. Just contact Ideal Specialty in Tulsa and ask for the red or blue sound processor panels, and mention my name. They'll know what to send you.

I chose blue LEDs for the blue processor and red LEDs for the red processor. They're all designed for panel mount, and the holes in the front panels are sized to fit. The blue LED is a Dialight 558-6003-007F and the red is 558-0101-007F, both available at Digikey. There is one hole just to the right of the power switch for the IR receiver.

The pushbutton switches are kind of cool, with the power switch having an internal LED that glows when the unit is on. The rest of the switches are just momentary pushbuttons. I debated on whether to have the volume up/down buttons colored to match the processor, i.e. blue for blue and red for red. But I think having all the switches black looks better.

Part numbers for each of the switches are shown below:
Black switch with blue LED
Black switch with red LED
Black switch
Blue switch

I only inserted a few of the LEDs into the front panel to test fit. They look really good to me when they're on. I plan to limit current so they aren't glaring. Subtle.

The picture below shows the approximate layout of the board and transformer in the chassis. Actually, I may mount the transformer near the front panel because most of the audio lines stay near the back panel. This would have a twisted pair from the power connector up to the transformer, and a braid of three lines coming back to the board, all run along the edge of the chassis. Then again, I can always put the transformer right by the rectifier on the board, keeping the lines very short. Probably doesn't matter, but I'll try both and put a scope on the signal lines to see which layout couples the least 60Hz.

The transformer I chose is a (12CT, 1.0A) Signal Transformer 241-5-12 and the proto board is a Vector 8016, both available at Digikey. The board is much larger than needed though, even for the six-channel red processor. You need about 1/2 the area of the 8016 board, and even that is pretty sparsely populated in the blue processor. The red has 15 relays though, so it covers the board a little more. Either way, you can see I'll have the whole right side of the 8016 proto board empty:

File Attachments
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1) RDAC_panels.jpg, downloaded 9197 times
2) RDAC_buttons.jpg, downloaded 9052 times
3) RDAC_frontpanel.jpg, downloaded 9121 times
4) RDAC_board_layout.jpg, downloaded 9171 times

Subject: Re: IR Remote Control
Posted by Shane on Tue, 16 Oct 2012 15:58:51 GMT
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Wayne, has anyone worked on a circuit to incorporate a LCD type display for this where you've 0-99 or something? I think Bruce did that one with a display kind of what I'm talking about.

Subject: Re: IR Remote Control
Posted by Wayne Parham on Tue, 16 Oct 2012 16:22:33 GMT
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Yes, I've used three different displays. One is a numeric display - that's the one Bruce did, as you've said. Another is a bar graph, just a line of 10 LEDs. That's what I'm using in my prototypes. Then there's a third, a single LED to show volume setting by the intensity of the light. It's super easy - just take an unused RDAC output and put power and ground across it. Then

single-LED approach quite a bit, especially for the six-channel version. One indicator light per channel.

Subject: Re: IR Remote Control
Posted by Shane on Tue, 16 Oct 2012 18:49:51 GMT
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What about using a multi color single LED?

Subject: Re: IR Remote Control
Posted by Wayne Parham on Tue, 16 Oct 2012 20:23:04 GMT
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Might be kinda cool. But the multicolor LEDs emit one color when current flows one way and another color when current flows the other. The third color is made when presented with AC, alternating between the two colors and blending them togther to form a third. So it woudn't be quite as simple as the earlier approach I just mentioned, connecting an unused RDAC output to an LED through a current-limiting resistor.

Subject: Re: IR Remote Control
Posted by Shane on Sat, 20 Oct 2012 03:19:06 GMT
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The LED's are cool Wayne, but I really like the look of the LCD readouts like these that Uriah had at LSAF a couple years back. With a two digit display they look pro, but it may be more expense and hassle than it's worth to implement, I don't know?

http://lonestaraudiofest.com/2011/Photos/LSAF_2011_022.jpg

Subject: Re: IR Remote Control
Posted by Wayne Parham on Sat, 20 Oct 2012 15:14:33 GMT
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If you want a seven segment display - no problem - use the same one Bruce did. He used a display with red LEDs, but you can substitute another color or LCDs, if you wish. They're sold as panel mount meters, and there are a bunch of different styles to chose from.

Subject: Re: IR Remote Control
Posted by Shane on Wed, 31 Oct 2012 03:00:07 GMT
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Just wanted to let everyone know that Uriah has his boards and build info up on his website:

http://www.buildanamp.com/Remote-Control-Attenuator-Remote-Control-Kit-5V.htm

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Subject: Re: IR Remote Control
Posted by Wayne Parham on Thu, 01 Nov 2012 01:50:50 GMT
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Uriah's boards are nice and I would highly recommend them. Add a +/-2.5v supply and some switching logic and put it in a nice case. Sweet!

By the way, I've added some schematics for the power supply and the 10-LED indicator to the application notes:
Remote Control Notes

Subject: Re: IR Remote Control
Posted by Wayne Parham on Tue, 20 Nov 2012 06:34:52 GMT
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Making some progress, slowly but surely. I'm doing four of these prototypes, and have a lot of other work so I can't do much each week. But I have the boards done, ready to go into the chassis. Next, I'm planning to make a bunch of coax cables to connect the RCA jacks to the boards. Then I'll connect them and the switches and LEDs and mount the boards. I hope to have at least one of them done before Christmas.

Subject: Re: IR Remote Control
Posted by gofar99 on Wed, 21 Nov 2012 01:41:26 GMT
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Hi Wayne, And I thought some of my prototypes looked like spaghetti factories.

That BTW is why I use a lot of colored wires in prototypes. It is much easier to trace the wires - particularly if something doesn't work right.

have you considered using something like Express PCB to do boards?

Have a great Thanksgiving in any case.

Subject: Re: IR Remote Control
Posted by Shane on Wed, 21 Nov 2012 02:42:23 GMT
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Bruce, have you seen Uriah's PCBs?

Subject: Re: IR Remote Control
Posted by gofar99 on Wed, 21 Nov 2012 03:06:42 GMT
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Hi Shane, No. I have not seen them.

Subject: Re: IR Remote Control
Posted by Shane on Wed, 21 Nov 2012 04:26:10 GMT
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They are on his buildanamp.com site.

Subject: Re: IR Remote Control
Posted by Wayne Parham on Wed, 21 Nov 2012 05:27:12 GMT
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These prototypes were sort of a step back in time for me. I used to always make prototypes like this, and that all-red wiring was my signature build style. I've done prototypes that were 50 times more complex, no kidding. One processor/controller I did filled a board twice that size. So this is nothing, four chips and that's it. Just nothing. Kinda wanted to do it that way, just for sentimental sake.

These days, I'd definitely do a small PCB run for protos. Back in the day, it was too expensive to do that. I'd only go to fiberglass once I was doing a run of several hundred at least. But these days, they'll practically give you a short run on the hopes you'll do a long run.

I still have relationships with some of those shops, because I still get boards. I buy lots of crossover boards, for example. I sometimes get the pretty silkscreened boards with plate-through holes, solder mask and silkscreening. Other times, a simple single-sided board without a mask or silkscreen is fine. The crossover boards are the latter.

So but anyway, my IR-remote protos are a labor of love, probably a last hoorah for me on the point-to-point perfboard build style. Just had to do it, one last time.

And, yeah, like Shane said, Uriah had boards made. I did the processor chips for others to develop boards and systems for. I didn't want to go in the amplifier business, 'cause then I'd sort of be in competition with the guys I made the chips for. So this is just a firmware deal, and I'll provide the chips, allowing others to provide the rest.

Subject: Re: IR Remote Control
Posted by Wayne Parham on Mon, 31 Dec 2012 01:50:56 GMT
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I made a little more progress today. Soldered on all the shielded lines for the RCA connectors. There are five pairs for the inputs, and two pair of switched outputs, one attenuated and one not. The unattenuated line will be used as a pass-through for recorders and the unattenuated line is the output for the amplifier. There are actually two sets of connectors for the attenuated line out, and one for the unattenuated outputs.

File Attachments
1) RDAC_Proto_Board_w_Coax.jpg, downloaded 4829 times

Subject: Re: IR Remote Control
Posted by Wayne Parham on Mon, 07 Jan 2013 02:58:59 GMT
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...and now with the backpanel connected:

Subject: Re: IR Remote Control
Posted by Shane on Mon, 07 Jan 2013 03:48:03 GMT
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Holy crap, Wayne. What a birds nest of wires   Looks like the Meier Corda Cross crossfeed I build one time.

I need to get my parts list together and get with you to figure out what I still need and what goes where.

Subject: Re: IR Remote Control
Posted by Wayne Parham on Mon, 07 Jan 2013 17:04:55 GMT
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It does look kinda cluttered with wires, but most of that is input and output connections. The actual "meat" of the circuit is very simple - Just four chips. And two of those are for the display, so really, the whole brains of the system is just two chips. Probably as simple as it gets.

I think yours will be nice and clean, using Uriah's printed circuit boards. You'll have to snap a few photos to show the difference a PCB makes.

Subject: Re: IR Remote Control
Posted by gofar99 on Tue, 08 Jan 2013 03:51:54 GMT
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Hi Wayne, what kind of sauce do you serve with that spaghetti?

Regardless, I understand the problem with input and output connections. They always seem to be going every which way and look like crud. It does bring to mind something that many new diyers get wrong. That is using the shields on cables inside the unit to carry the signals and ground returns. The problems are ground loops and noise. The best way is to have all the grounds at the input jacks connected together and single ground wire from there going to the main circuitry. Then only connect the shields on the cables at the input ground end. DO NOT connect both ends. The use of a central ground at the inputs is essentially a variation of a "star" ground

system and the remaining ground connections from things like the power supply should also connect there. Avoid at all costs using the same piece of wire to carry both signal and power grounds. You will get noise. Also a once common thing, but in actuality a very bad thing for quality audio is don't use the chassis as a ground for the audio circuitry. It is fine to use it as a shield and a protective measure (connected to the AC mains earth ground) but not for audio. The above is really quite simplified as there are whole books written on the subject. The method I mentioned though is the only way I could get some of my really high gain circuits to be -90 dbv quiet.

Subject: Re: IR Remote Control
Posted by Shane on Tue, 08 Jan 2013 04:23:00 GMT
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That's good advice, Bruce. I've done that with shielded wire many times in headphone amps. On my 1626 Darling I have a safety ground tied to chassis right at the power entry point. All my signal grounds are individually tied to a star point on the chassis right in the center. It was the quietest I could get it with that arrangement. On my relatively efficient Klipsch Heresys or Pi Two towers I can't hear any hum or noise with the volume turned up and my ear 6-12" from the drivers. Good enough for my rig!

Subject: Re: IR Remote Control
Posted by Wayne Parham on Tue, 08 Jan 2013 16:11:30 GMT
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It's a mess, isn't it guys?!!

But I gotta leave it that way for now, 'cause I have to move wires around to get my iron into places as I complete the build. When it's done, I'll run the lines nicely as I install it into the chassis.

About grounding, I think Bruce's suggestion of a single-point ground is generally good sage advice. I tend to like using single point grounds, in most cases.

But my experience with industrial control circuits, especially those run by digital control systems, has taught me a thing or three about grounding. There are places where a multi-point ground is preferred. That's an aside though, because for audio amplifiers, I agree generally that a single-point "star" ground arrangement is best. Or most likely, a bus connecting a handful of individual stars.

In addition to the "star" ground, one can use a bus arrangement, where the main ground conductor is necessarily long. A case like that would be a long wire run along, with several drop points. The ground at each drop is taken from a single ground main, and not run individually back to the source (like a really long star). Or a multi-point ground, which is essentially a grid of interconnections. This is a little trickier, because it really requires balancing the conductivity and curent flow in each conductor.

This kind of multi-point grounding system is most useful in situations where high-current circuits must be connected to more sensitive low-current circuits. It's easier to isolate them, but where that isn't possible, a multi-point grounding approach is often used. An example is digital control circuits that drive large motors at high current levels. The switching of the current both induces currents into the digital circuitry and also creates spikes from IR voltage drops at startup and shutdown. That's what causes ground loops, the IR drop between connections as current flows through each leg of the circuit. If there's a difference, then there's a ground loop.

What I see in audio systems is the star approach is generally best within each device, but one should always remember that the system is then a collection of several stars. The best approach, then, is to have each star (the grounding inside each device) connected along a bus. It also can be done as a star of stars - Each device connected to a single point ground. Either can be made to work, but I find in practice, for audio circuits, a bus of stars works best.

The distinction doesn't matter too much until you have to connect your internet or cable TV. You can usually connect all of your equipment to one outlet, and then the grounding is really a star of stars, which is still a single point. But once a cable TV connection is made, we have the earth ground from the power grid connected to the earth ground from the cable TV, and there is generally a large difference in ground potentials. That introduces a ground loop, one that is usually really noisy. The best way to handle this is to isolate the ground from the cable TV using a coupling transformer.

Probably the trickiest ground problems I see are when a large metal body is used as a ground conductor. I see this in factory assembly lines, where the conveyors, rack and tables are grounded. I also see it in automobiles and airframes. This sets up a condition that is not unlike the problem of connecting two physically distant earth grounds - Current flow through the earth (or the metal body, in this case) passes through different impedances depending on the physical distance between connection points, the quality of material between connection points, and the possibility of any anomalies between connection points like microcracks or bolted junctions. So there are ground loops within the body of the ground conductor, itself. This is where multi-point grounds make the most sense.

The bottom line is grounding is truly an impedance matching excercise, done at very, very low impedances. In a hypothetical perfect system, we could have a single superconductive ground where there were no potential differences no matter where we connected to ground and no matter how much current flowed through it. But since all conductors have resistance, this isn't possible, so the grounding exercise is really a way of making any local grounds "float" at exactly the same potential above ground. Where two devices are connected, we want their local grounds to be exactly the same, even if at some other point down the line, the local grounds may be a few picovolts different. Whatever method or methods work best to achieve that goal is what makes the most effective grounding scheme.

Wow, I just went way down the rabbit trail, didn't I?

File Attachments

Subject: Re: IR Remote Control
Posted by gofar99 on Tue, 08 Jan 2013 16:40:52 GMT
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Hi Yes indeed just like the rabbit in Alice in Wonderland.

Anyhow, yes grounding is not nearly as simple as it would seem. In a typical audio project I use the metal chassis (if there is one) as a shield directly connected to the earth side of the AC mains at the input power jack. I use only IEC three wire connections and always a line filter there. I isolate the power supply and signal portions of the circuitry and at a single point of each connect them together. Often at the input as mentioned before. Then from there connect the chassis to the circuitry ground through a 0.1 to 0.22 uf type X2 capacitor with a parallel resistor in the range of 120-150 ohms. This arrangement does two thing, first lets the chassis act as a shield for the stuff inside, and second as a protective barrier if there is an internal fault that would possibly energize the chassis. I use the buss arrangement on occasion as well. This can be the case when there are numerous physically isolated ground connections. I still keep the power and signal grounds separated though. It may then require two busses that eventually connect. I like to use silver wire for the signal buss and large diameter copper wire (12g or larger) for the power buss. The choice of wire largely depends on the the magnitude of the current flow and how low the impedance must be for good S/N.

As Wayne noted when it all connects to the AC power source things can get a bit funky. You can get external ground loops through the AC ground just as easily as internal ones. The bit about CATV systems is right on. I had that problem in one set up. The CATV and AC mains grounds were not the same and a huge amount of noise was introduced into the audio. The fix for that was a ground isolator in the CATV line. My present stereo is not connected to the CATV or any other external source (like Ethernet) thus no contamination.

I guess I went down the same rabbit hole.

Subject: Re: IR Remote Control
Posted by Wayne Parham on Tue, 08 Jan 2013 17:31:52 GMT
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transformers. Now days, the isolators are probably becoming very common because most people are connecting their home theaters to cable TV. But not long ago, there wasn't such a thing to be

connected to the 300->75. It works great, only introduces a couple dB loss (which is probably the same as the isolators) so if you have any of the old matching transformers laying around from back in the analog antenna days, don't hesitate to use them.

Subject: Re: IR Remote Control
Posted by Wayne Parham on Fri, 11 Jan 2013 05:06:56 GMT
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It's built and tested. I'm itching to put it in the cabinet and wire-tie that mess of interconnect and LED wires, but I probably won't get to that for a few days. Gotta hit the road tomorrow and won't be back 'til Sunday. But here's a view of the working circuit and the front panel:

Subject: Re: IR Remote Control
Posted by Wayne Parham on Mon, 14 Jan 2013 07:45:55 GMT
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Here are a few more pics, with the board installed in the cabinet:

And here with the camera pointing a little more straight down, to get a better view of the board and stuff inside:

And now a shot of the box, buttoned up and ready to go:

File Attachments

1) blue_box_open.jpg, downloaded 4791 times
2) blue_box_board.jpg, downloaded 4776 times
3) blue_box_closed.jpg, downloaded 4726 times