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From:	Carl S. (carl@techaccessinc.com)		
Date:	7/2/2002 1:11 AM		
Subject:	Is the chassis SUPPOSED to be tied to ground?		

I took great care to make sure the circuit ground remained insulated from the "safety ground" 3rd prong lead which I tied to the chassis. (US power cord).

I am getting horrid hum and my chassis sits about 12v higher than my signal ground. When I clip my scope ground to the signal ground all is quiet.

This is a part of the star grounding/proper grounding that baffles me.

So do I have some other problem or SHOULD the chassis be tied to the signal ground? (In one place, I assume).

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From:	Gil Ayan		
Date:	7/2/2002 1:55 AM		
Subject:	CHASSIS-GROUND YOUR CIRCUIT		

On 7/2/2002 1:11 AM, Carl S. said:

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Well, I wouldn't leave the whole circuit ground "floating," which is what you are currently doing.

This is a part of the star grounding/proper grounding that baffles me.

The idea behind the ground star is to have a single point where all the grounds attach to the "reference voltage." In your case, you really don't have a reference voltage per se, as the circuit floats.

Now, I don't use a star grounding scheme in any of my amps, I use basically two main ground points -- and other points in between. One is closest to the AC ground, where the ground from the 3-conductor power cord attaches to the chassis, and that is for the power supply 1st ground... I progressively work my way to the other end of the chassis, where the input jack grounds the incoming signal.

So, for example, to give you a simplified description: looking at the chassis, all preamp stage cathode and other grounds (including the power supply grounds for those stages, ground on the volume controls and tone stack, etc.), tie to the ground the input jack uses a the left of the chassis. The next ground point is for the phase inverter cathodes and the power supply ground for the phase inverter, both of which go to the same ground, which is where my FX loop has its ground, and this is roughly located in the middle of the chassis. Next up will be the power stage power supply grounds, bias network and the power tubes' cathode ground, which is located at the right of the chassis. SEPARATE from all of that, on its own dedicated ground, is the GREEN wire from the AC. Lastly, I have use relays for channel switching; the power supply for that has its own ground point, separate (and far enough away) from everything else.

The whole idea is to not have any ground loops inside the amp. The problem with leaving the circuit floating like you do, although you probably don't have a single ground loop, is that whatever ground your circuit chooses to settle at will NOT be the same as the chassis ground, something you

have already found out (you measured 12V, right?). Problem with that is that I think you're asking for trouble already, IMHO. When you touch the guitar strings, you will be at 12V with respect to the chassis, so if you touch the chassis at the same time, you will experience a (most likely not noticeable) shock, and if you have outboard gear, or sing into a mike, the problem compounds from there.

So do I have some other problem or SHOULD the chassis be tied to the signal ground? (In one place, I assume).

If you want to just tie your "single star point" to ground, do so -- I highly recommend that. If in doing so you find some perceptible levels of hum, you may have to modify your grounding scheme. Randall Aiken's site will probably have some good information on this subject.

Note the following: the chassis, when tied to the circuit ground, will SHIELD the circuit, and RF noise will be reduced that way. If you float your circuit ground, as far as IT is concerned, the whole chassis is a big antenna, which happens to be at another potential and noise will result.

Be careful with the grounds... A properly grounded chassis, and the use of a 3-conductor power cord, will make the likelihood of getting shocked virtually non-existent, and that is a must in my opinion.

Good luck,

Gil

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From:	Carl S. (carl@techaccessinc.com)		
Date:	7/2/2002 2:06 AM		
Subject:	Excellent, info...thanks Gil!		

That one got printed and put in the files!

Thanks again man.

Carl

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From:	John Fisher (fish@nd-studios.com)		
Date:	7/10/2002 7:44 AM		
Subject:	Re: CHASSIS-GROUND YOUR CIRCUIT		

Gil,

I have a question you might be able to answer.

In theory a true star ground is where every ground connection in the circuit has its own wire that leads back to a common point where all the grounds meet, usually near the first power cap ground wire of the power supply. (I am assuming).

If that is correct, then why would you make other ground points further up the circuit where more than one ground wire of each section or stage at first connected together, then brought to the star ground point. Is that just out of practicality to run less wires or is there some advantage to the way the circuit works?

I hope I am clear in my question.

Thank!

JOHN FISHER

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From: Gil Ayan
Date: 7/10/2002 4:37 PM
Subject: Re: CHASSIS-GROUND YOUR CIRCUIT

On 7/10/2002 7:44 AM, John Fisher said:

*Gil,
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In theory a true star ground is where every ground connection in the circuit has its own wire that leads back to a common point where all the grounds meet, usually near the first power cap ground wire of the power supply. (I am assuming).
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I hope I am clear in my question.
Thank!
John Fisher*

I am hardly an expert, but this is a combination of what I have read on the subject and what makes sense in my head. First of all, if we consider the chassis to be a perfect conductor (which it isn't), then the whole chassis is one big star ground point. 😊

Then, the idea behind the successive grounds is as follows: for example, the first ground would be at the input jack (unless you isolate the jack or use a Marshall type plastic bushing one). Note that the guitar pickup connects to that ground and the "+" input to the amp. Now, the impedance of pickups is typically low (very low if active pickups are used, but always say below 20K). Furthermore, the output of the pickup is on the order of hundredths of a volt. So, that particular ground point is very "stable" because you don't have any high voltages or large signal variations pulling it up.

As you progress into the amp, and finish at the power supply on the other end, you have voltages as high as 500 VDC or more, high current demands and rippling at 60 and 120 Hz. The idea is that at that point, surges in the circuit will make the ground not so "stable" from the point of view of a small signal, like that of the guitar's pickup. It is possible that these ground voltage variations could modulate the guitar pickup signal.

So the above logic makes sense to me, but it could be wrong. Bottom line is that I have never had any problems laying out a ground scheme in that fashion. 🗑️ As for the 3-prong chassis ground being separate, that is actually a UL requirement which makes sense: that ground should be as solid as can be and not compromised in any way, since it is a "life saving device" so to speak.

Gil

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From: Matthew Springer (mirage_indigo@yahoo.com)

Date: 7/10/2002 4:47 PM

Subject: Re: Is the chassis SUPPOSED to be tied to ground?

Carl,

If you tied the ground lug of your three prong cord straight to the chassis and it's still sitting about 12V off ground you have a problem. Just a guess but it sounds like you're getting charge build up on your chassis due to the ground connection not being all that great. If this is the case, the hum would probably also go away when you touch the chassis. Also is your scope three prong as well? Are they plugged into the same outlet or different ones?

Aluminum or steel chassis? Mechanical or solder contact to the chassis?

And also try your amp in a different three prong outlet. It's possible that particular outlet isn't wired right.

-Matthew

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From: RAfael**Date:** 7/26/2002 4:41 AM**Subject:** Re: Is the chassis SUPPOSED to be tied to ground?

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rafael

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From: Tom S. (TwweedDeluxe@NOSPAMcomcast.net)**Date:** 7/27/2002 9:31 PM**Subject:** Re: Is the chassis SUPPOSED to be tied to ground?

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