Re: HELP With Step−Down Transformer and Converter

Source: http://sci.tech−archive.net/Archive/sci.electronics.design/2005−09/msg03780.html

- *From*: The Phantom <phantom@xxxxxxx>
- *Date*: Tue, 20 Sep 2005 19:13:11 −0700

On 20 Sep 2005 14:27:57 −0700, "gene" <winapps2@xxxxxxxxxxxxxxx> wrote:

>Dear Phantom,
>I have broken−down what I need as follows:
>A. 2 Volt Lead Acid Gel Cells, RAted 25 ampere−hours (6 pcs)
>B. 12 Volt Cylindrical Battery (1 pc), looks like a big AAA Batery
>right?

No.

The 12 volt battery I was referring to is *made* of 6 pcs of 2 volt cylindrical lead acid gel cells. I think it may be easier to find a 12 volt battery of 6 cells than to find the individual 2 volt cells.

>C. Ammeter, DC responding (1 pc)

If you use a shunt + millivoltmeter, then for the AC setup the millivoltmeter must be AC responding; for the DC setup the millivoltmeter would have to be DC responding. This millivoltmeter could be a hand−held DVM, such as a "Fluke" meter.

If you want a self−contained ammeter (no shunt, in other words), it would be the clamp−on type, and those are pretty much all AC responding.

>D. Switch for the safety disconnect

This would be for the AC setup (on the primary of the transformer); for the DC setup the breaker(s) will also serve as the safety disconnect.

>E. 5000 amp shunt (1 pc)

This would be for the AC (3000 amp) setup. For the DC setup, you might want a 1000 amp shunt. If you can live with the reduced resolution, you *could* use a 5000 amp shunt in your DC setup; just switch the millivoltmeter from AC responding to DC responding.

>F. millivoltmeter

This could be a hand−held DVM, such as those made by Fluke, or any other similar unit.

>F. Circuit Breaker 12 Volt DC−Rated, 750 Amp (1 pc)

Or three 250 amp breakers in parallel, or some other combination that adds up to 750 amps (all the same, of course), if you can't find a 750 amp breaker.

>G. 12 Volt Charger (AC to DC)
>
>Series Connection When Charging:
>AC Outlet >>>>> Charger >>>>> +Battery #1− >>>>> +Battery#2+
>>>>>>+Battery#6−

The individual 2 volt units are properly referred to as "cells"; when you connect a number of them together, you have a battery (of cells). The 12 volt battery is properly referred to as a battery of 2 volt cells, so the connection is AC outlet>>>>charger>>>Cell #1>>>Cell #2>>>etc.>>>Cell #6. If you got the cells already wired up as a 12 volt battery, you just rewire it that way to charge.

>
>Parallel Connection when Generating High Current
> _
> | | | | | | |
>Battery#1 Battery#2 Battery#3.....Battery#6 Cir.Breaker====| Ammeter
> |_ _ _ _ _ |_ _ _ _ _|_ _ _ _ _ _ _ _|_ _ _ __| |_ _ _|
>
>1. Where do I put the Switch, Shunt and Millivoltmeter in the diagram
>above?

The breaker *is* the switch. The shunt is in series after the breaker and the millivoltmeter is connected to the small screws on each side of the shunt−−the meter connection points. Like this:

_ _Cir.Breaker_ _Shunt_ _
| | | | |
Cell#1 Cell#2 Cell#3.....Cell#6 |
|_ _ _ _ _ |_ _ _ _ _|_ _ _ _ _ _ _ _|_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _|

The piece of wire that conpletes the connection from the right side of the shunt and comes back to the bottom connection to the 6 cells is what determines how much current there will be. That's the piece that I said should be about 8 feet of 2/0 (that's pronounced "two aught") cable.

>
>2. Do you mean that I should dissect the 12 Volt Cylindrical battery
>and use the wires inside it as connectors to the Lead Acid Batteries?

If you get a 12 volt battery made of Gates cylindrical cells, the "wires" that connect the cells together will be straps of plated copper. They will be very easy to get at. If you get a 12 volt battery with a "rectangular" shape, the individual cells will not be accessible without destroying the battery. The individual Gates cells are readily visible and accessible in the type of battery I'm recommending. To wire th cells in parallel you need to use very heavy copper conductors. You could get copper tubing at the hardware

store, say 3/8" and cut off appropriate lengths, flatten the ends with a hammer and drill holes to connect to the cells.

>
>3. Although I can get very high current in the above setup, my voltage
>would exceed the 0.90v to 1.50v range that I wanted, isn't it?
>Basically, high current is generated by shorting the battery, is this
>right?

Right. But the 2 volt cell voltage will drop when they are shorted. I don't know exactly how much, but the voltage will drop more or less linearly along the length of the cable. For some length the voltage drop will be .9 to 1.5 volts.

>
>4. If I decide to have a high DC Current and still maintain the DC
>Volts at 0.90v to 1.50v range (to test faraday's induction law), I can
>still use the design for the primary and secondary coil you provided,
>right? Then I would need an interruptor to induce high current, right?
> What should I use for an interruptor or where can I buy one? Is it
>the same as pulsed DC?

Well, it would be pulsed DC all right!

>
>I tried using a 12Volt Cylindrical BAttery some time ago and had a
>smaller model with a thin Primary and a thick Secondary but I was not
>able to induce a higher current in the secondary. My research tells me
>that what I need is an interruptor that will correctly turn the primary
>circuit ON/OFF at precise time. I used an ordinary ON/OFF switch as my
>interruptor but nothing happens.

I'm going to try to email you. If the email address in the header isn't going to reach you, can you post one that works? You could always go get a throw−away hot mail or yahoo account for this purpose. If you post a real email address that you don't want to get spammed, don't forget to disguise it, say with alternate spaces between letters or some such.

>
>Gene
>
>
>The Phantom wrote:
>> On 19 Sep 2005 13:29:52 −0700, "gene" <winapps2@xxxxxxxxxxxxxxx> wrote:
>>
>> >Dear Phantom;
>> >
>> >I can't thank you enough for your help.
>> >Don't worry, I will be careful. I will stand in another room holding
>> >the switch, wear goggles, leather gloves, and all the necessary
>> >precautions. I know it is dangerous to handle such high voltage.
>>

>> Actually, it's high *current*, not high voltage you're dealing with in the DC setup, and
>> in the AC setup the high voltage (240 volts) is only on the primary side of the
>> transformer. But really high currents pose a danger of a different sort. You won't get
>> electrocuted or even shocked by the high current circuits you propose to create. The
>> danger is molten metal splattering around.
>>
>> >I have my camcorder setup to record evrything that happens so I really
>> >don't need to be close.
>> >
>> >Your assumption is correct. I only want to get a high current in a wire
>> >for its
>> >magnetic effects, and not to drive a load, and YES, I would not mind
>> >spending some money on it.
>> >
>> >In the Dc−Dc setup using gel cells, do I need to have an interruptor?
>>
>> Your are thinking that you need an "interruptor" to get the DC to provide "transformer
>> action" so it can be stepped down in voltage and up in current. With the lead acid
>> battery, this is not needed because a transformer is not needed. This is why I recommend
>> the gel cells rather than a DC−DC converter. It's much simpler.
>>
>> But, remember in my previous post, I said:
>>
>> "You must have some disconnect device
>> in series with the battery (near one terminal of the battery), such as
>> a DC rated circuit breaker:
>> http://www.solarseller.com/dc_circuit_breakers_12_volts_to_125_volts.htm
>> or fuse."
>>
>> That's a type of "interrupter", but it's not to get "transformer action". It's more
>> commonly called a "disconnect". The idea is that if anything goes wrong while the
>> experiment is running and some of the wiring becomes red hot (this has happened to me as a
>> teenager. We all learn some of these lessons the hard way), when you panic and try to
>> undo the bolts connecting the wiring to the battery, you discover that red hot wires burn
>> you. You need a disconnect so that all you have to do is flip the switch and everything
>> is turned off. The disconnect should be the first thing in the circuit connected to one
>> of the battery terminals where no other wire can bypass around it. What I am recommending
>> is that you use the big DC rated circuit breakers as switches to turn the current on and
>> off, and since they are breakers too, they will automatically disconnect if the current
>> gets too high. If you chose to use a fuse for the current limiting function, you must
>> still have a switch there for the safety disconnect. That's the advantage of breakers;
>> they are switches too. (Such high current fuses are expensive, by the way.)
>>
>> In your high current experiments the danger of molten metal comes from making
>> connections when the circuit is energized. When you touch two pieces of metal which will
>> carry 3000 (or even 750) amps when the connection is made, the sparking at the point of
>> contact can splatter molten metal. You should turn off the breaker or switch while making
>> the connections to the ammeter and whatever else is in the high current circuit. This is
>> just common safe practice when working with electricity. Don't work on energized
>> circuits. Hook everything up the way you want it, *then* turn on the switch or breaker.
>> If you made a mistake and too much current passes, the breaker will open and avoid serious

>> damage. Then you have to troubleshoot your setup and figure out what you did wrong.
>>
>> For your AC setup, the house breaker in the 240 volt circuit will provide the safety
>> disconnect in the event of a short circuit. If you build the transformer I described, you
>> should mount it in an appropriate electrical enclosure (box) with a switch on the primary
>> (240 volt) side so you can turn it on and off while you're working on the high current
>> side without having to run to the house breaker box. You don't want to have to provide a
>> switch on the 3000 amp secondary side; it would be very big and expensive and it's not
>> necessary. Just turn off the 240 volts to the primary of the transformer when you're
>> working on the high current side. The breakers in the house service entrance are often
>> not designed to be used as switches for many on−off cycles anyway, so the extra switch
>> takes the wear and tear off the house breaker.
>>
>> >I understand that if I use AC, I do not need an interruptor since AC is
>> >already turning ON and OFF by itself, but in a DC setup, shouldn't I
>> >have an interruptor to induce a high current on the secondary?
>>
>> The DC setup I described doesn't need an interruptor. It doesn't have a transformer and
>> so there isn't a secondary; there's just the battery. The lead acid cells can put out a
>> very large current on their own. Have you ever shorted a car battery accidentally when
>> connecting jumper cables? When you start your car, the battery is supplying hundreds of
>> amps to the starter motor. Lead acid batteries are dangerous because of the high currents
>> they can supply. Most modern cars have a plastic sheath that covers the terminal(s) of
>> the battery, because if you are working on your car and accidentally drop a wrench across
>> the terminals of the battery without that sheath, you get a most impressive fireworks
>> display!
>> >
>> >To Answer your question on the soldering gun:
>> >How do you know you didn't get high current? How did you try to measure
>> >it?
>> >>>> I used a tester to measure the tip of the soldering gun.
>> >
>> >If you got heat, then you got high current.
>> > I maybe using the wrong equipment to measure current... like the AC sensitive ampmeter you suggested.
>> > I was just wondering, if the soldering gun produces a high current at it's tip,
>>
>> The high current is only in the tip; it doesn't get into the thing you're soldering.
>>
>> > would it not short circuit the CHIP that one is soldering or would it not electricute the user holding the lead?
>>
>> The soldering gun has essentially the circuit I described for your AC setup. It's just
>> a transformer with a single shorted turn of very heavy conductor for a secondary. If you
>> remove the actual tip that does the soldering and measure the voltage at the bolt−on
>> connections, it's probably quite low. My own Weller soldering gun has .35 volts open
>> circuit at the bolt−ons, and .24 volts when the tip is in place. That voltage isn't
>> enough to hurt anything. The current in the tip of a 100 watt gun must therefore be about
>> 100/.24, or about 400 amps. But the reason that can't hurt you is that the 400 amps can
>> only flow in the copper tip, not in your body nor in the thing you're soldering. It takes
>> much more *voltage* to cause that much current in a human body (thousands or volts,
>> although it doesn't take 400 amps to electrocute a person so a much lower voltage than

>> thousands can electrocute, but .35 volts is completely harmless through skin). Only a
>> virtual short circuit, such as provided by the heavy copper tip on the soldering gun can
>> cause that much current when only .24 volts is available to "push" the current.
>>
>> >
>> >What is a rare earth magnet? Where can I buy one?
>>
>> A rare earth magnet is a magnet made from mixture of substances which include what are
>> called the "rare earths". The elements samarium and neodymium are the two most common
>> rare earth elements used in modern magnets. These magnets are *very* strong, and the big
>> ones can hurt you by pinching you really hard when a couple of them smack together on your
>> fingers. You can buy them at:
>>
http://www.wondermagnets.com/cgi−bin/edatcat/WMSstore.pl?user_action=list&category=Magnets_and_Magnetism%
>> Get a couple at least of number 0013 and several number 0016 and whatever else strikes
>> your fancy. They are fun to play with! Don't let them get close to your watch, your TV
>> or your computer monitor or any floppy disks; and especially don't let them get close to
>> your credit cards. They will erase the magnetic strip on the card; don't even hold a
>> magnet in your hand and drop your hands down to your waist near a pocket with your wallet.
>>
>> >Lastly, Mike suggested that I should just buy a portable harbor freight
>> >220V spot welder... Does this portable welder use DC as source? Is
>> >MIke correct in saying that I would achieve and be able to measure the
>> >same high current induction?
>>
>> The designation 220V means that it gets its power from the 220 volt AC coming into your
>> house. I wouldn't know what it does after that without seeing a spec sheet, but Murphy's
>> law says that it won't do what you want.
>>
>> >
>> >My deepest gratitude to your efforts in helping me.
>> >
>> >Gene

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- ***References***:
  - ♦ ***Re: HELP With Step−Down Transformer and Converter***
    - ◊ *From:* gene
  - ♦ ***Re: HELP With Step−Down Transformer and Converter***
    - ◊ *From:* The Phantom
  - ♦ ***Re: HELP With Step−Down Transformer and Converter***
    - ◊ *From:* gene
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  - *From:* gene

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