

IBM BladeCenter H

Power Planning



Submitted to www.xseries.org by Doug Toth

The IBM BladeCenter H comes with several power cord options.
This document will focus on the two most commonly used in the US.



Triple IEC-320-C20 connectors

Typically used with existing PDUs or where C19 PDUs are preferred for standardized plug availability.



Dual NEMA L6-30P connectors

Typically used where existing L6-30R outlets are already in abundance, or to eliminate the need for PDUs within cabinets.

C20 Power Cords

The triple C20 option can be a little tricky to plan for. There are multiple amperage draws to plan for and they don't match well to the existing IBM PDUs.



#1 – labeled as 16A. Connected to a 2900w power supply, so realistic amperage draw is about 14a (at 208vac)



#2 – labeled as 16A. Connected to a 2900w power supply, so realistic amperage draw is about 14a (at 208vac)

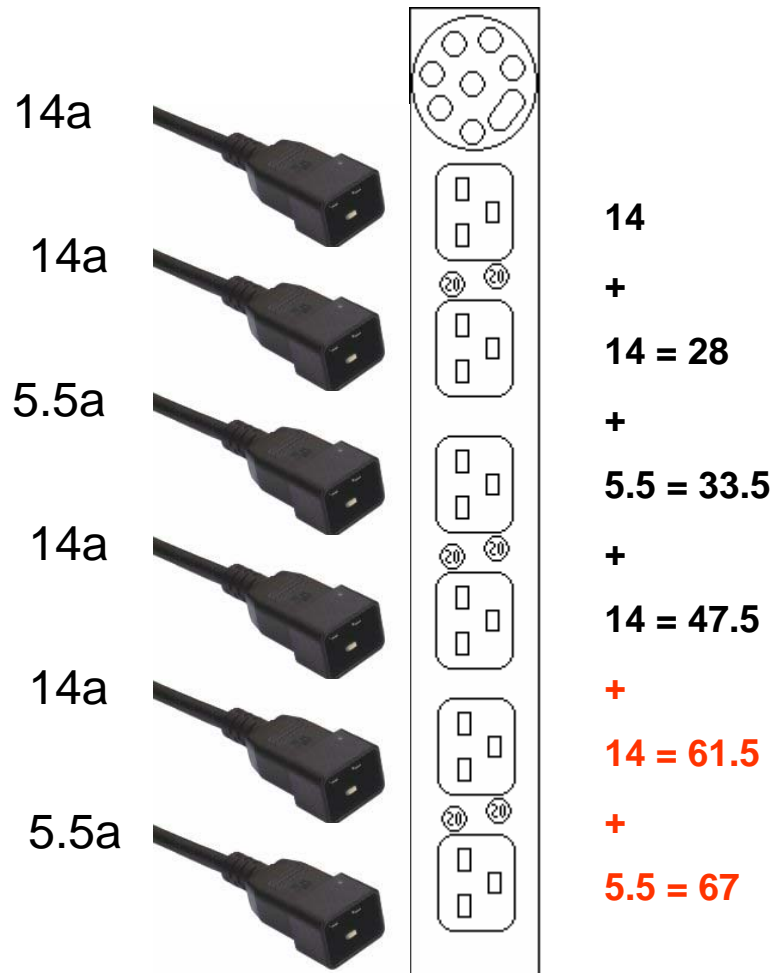


#3 – labeled as 5.5A. This runs a blower (direct AC connection) as well as the center switches. Long term plan for this to really be 5.5a.

C20 Power Cords

The IBM PDU Dilemma – part 1

Due to UL regulations in the US, a 60amp, single phase PDU is derated to only 48amps of deliverable power (80% of the circuit capacity).

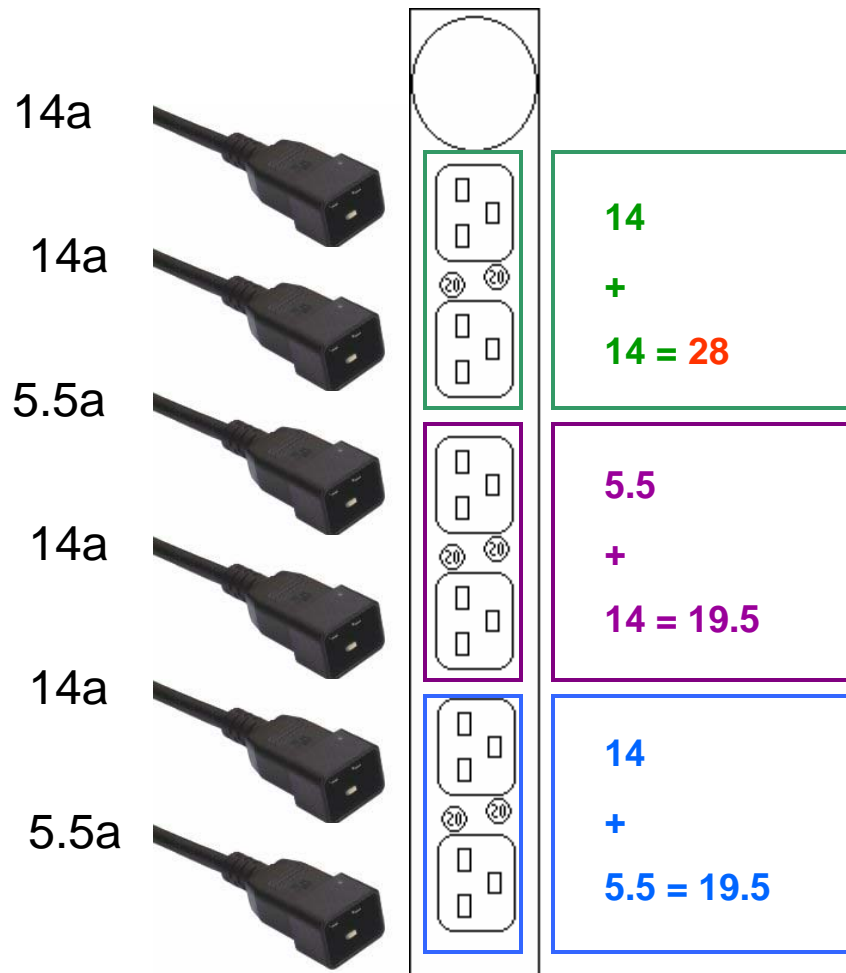


Two chassis power cords will exceed the capacity of a single phase PDU.

C20 Power Cords

The IBM PDU Dilemma – part 2

Another option is the 3phase 60amp PDU. This effectively provides 90amps (when compared to the single phase), or 72amps deliverable.



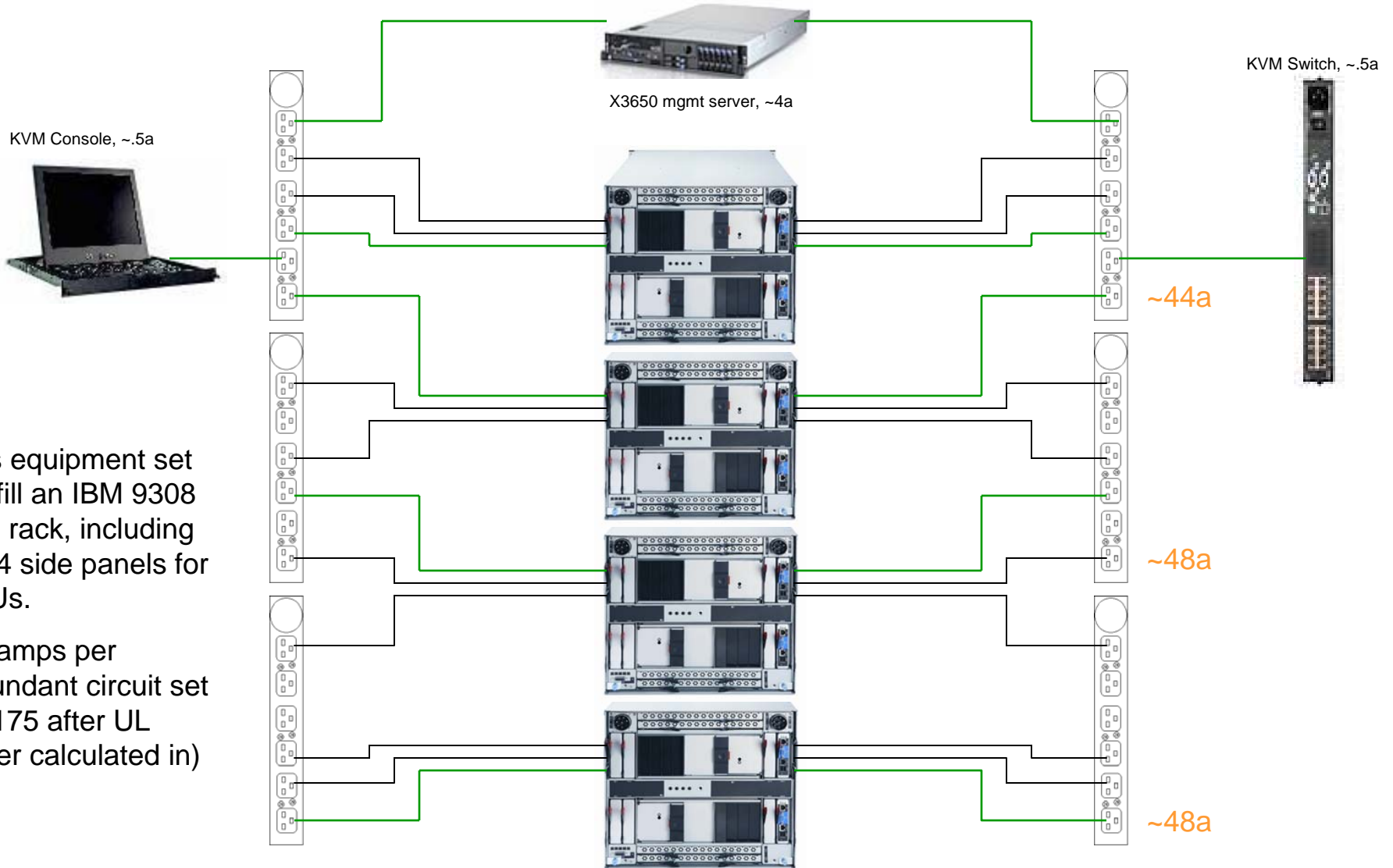
However, 3 phase power works a little differently than single phase power. You end up with 3 separate power domains to track, taking us from simple addition to low end calculus.

To oversimplify it, each pair of outlets is a power domain for the PDU. While each outlet can support a 16a plug, each domain is limited to 24a (1/3 of 72a).

2 domains are fine, but the 3rd one just won't fit into the PDU limits

C20 Power Cords

Rack wiring – single phase power real world example



This equipment set will fill an IBM 9308 42U rack, including the 4 side panels for PDUs.

140amps per redundant circuit set (or 175 after UL buffer calculated in)

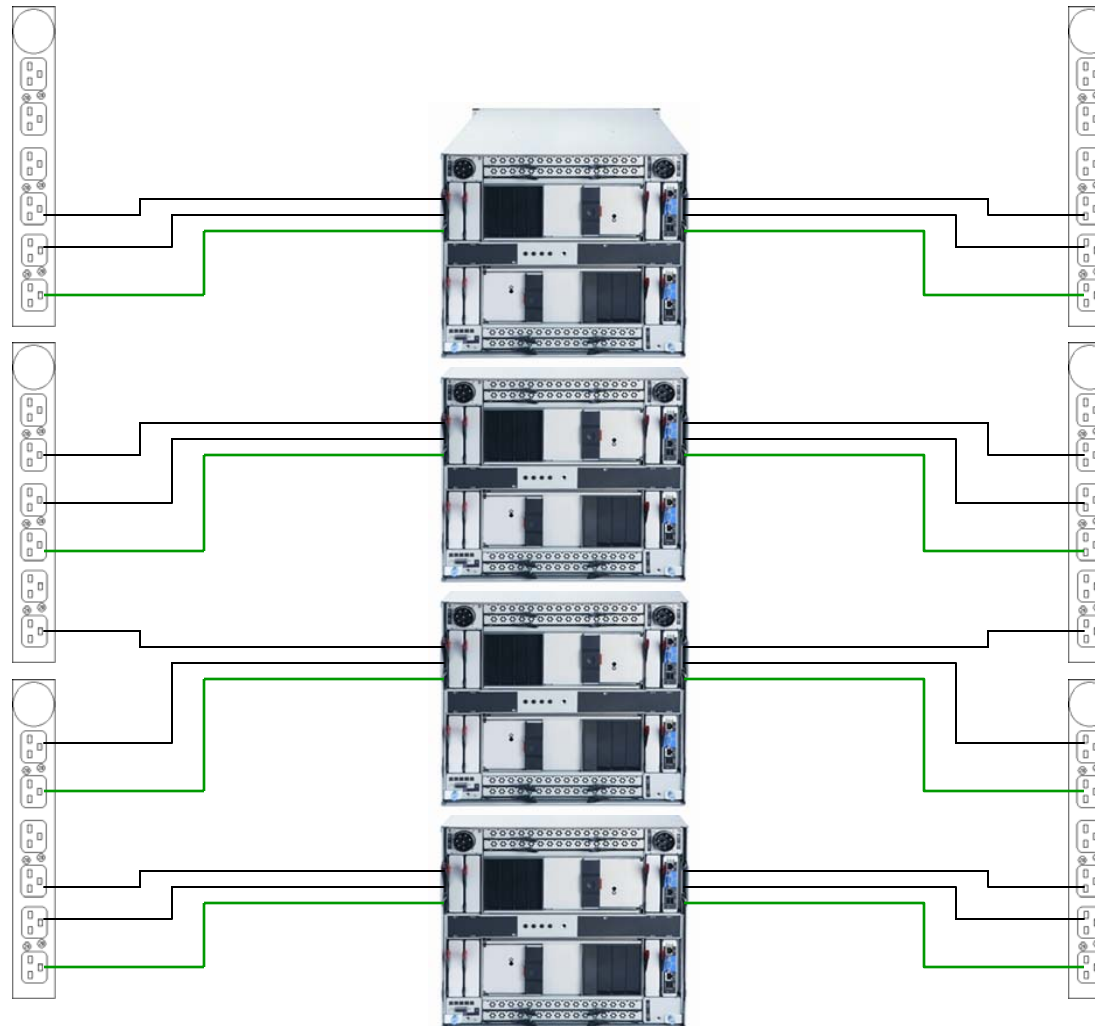
BladeCenter: Black lines = 14amp, Green lines = 5.5amp

C20 Power Cords

Rack wiring – 3 phase

There is some capacity left on each PDU (as wired here) for additional devices, such as kvm, network or SAN switches, and even a management server, if things are placed thoughtfully.

The prior slide, however, showed that single phase will work fine for this equipment, allowing a rack to be filled to capacity.



Black lines = 14amp, Green lines = 5.5amp

C20 Power Cords

The IBM PDU Dilema – conclusion

Neither of the IBM PDUs designed to handle the older model BladeCenter are a very good fit with the new BladeCenter H. It doesn't get any better if you move to other brands of PDUs.

Until a new breed of PDU is developed to handle the power requirements of the BladeCenter H, we'll need to use larger quantities of PDUs than we did with the prior generation chassis (six per rack instead of 4).

L6-30P Power Cords

The other US option

The power requirements for the chassis do not change, but the option for L6-30P plugs does give some good flexibility in the power infrastructure design.

Internally, it's still 3 circuits routing to the two plugs – two 14amp circuits and a 5.5amp circuit. This is taken care of by pairing the 5.5amp circuit up with a 14amp on one of the plugs, for a total of 19.5amps (still less than the 24amp max on the 30amp plug).



L6-30P #1 – 19.5amps



L6-30P #2 – 14amps

L6-30P Power Cords

The conclusion

This is going to require a LOT of breakers in the power distribution panel. For a single rack with four BladeCenter H chassis, you will need sixteen breakers and sixteen L6-30R receptacles under the floor. That a lot of outlets and panel spots. And that's assuming you don't want another pair of PDUs to power kvm equipment, a management server, and maybe a switch or two in the remaining rack space, which I'll add into my calculations for a total of eighteen.

Even though this is an option, the 6x 60amp single phase option may be better, simply due to power cord and breaker counts.

The upside is that none of those are actually pulling their limits, so you only need about 400amps of service (2x200amps, for full redundancy) to handle that one rack (as opposed to $18 \times 30 = 540$).



L6-30P Power Cords

L6-30R PDUs

One option would be to get a PDU with multiple L6-30R receptacles and a larger (or hard wired) power cord back to building power. However, even a 100amp capacity circuit only gives you room for four or five cords, so either build it big or don't bother.

As packages show up targeted at this space, I will update this document to reflect them.