



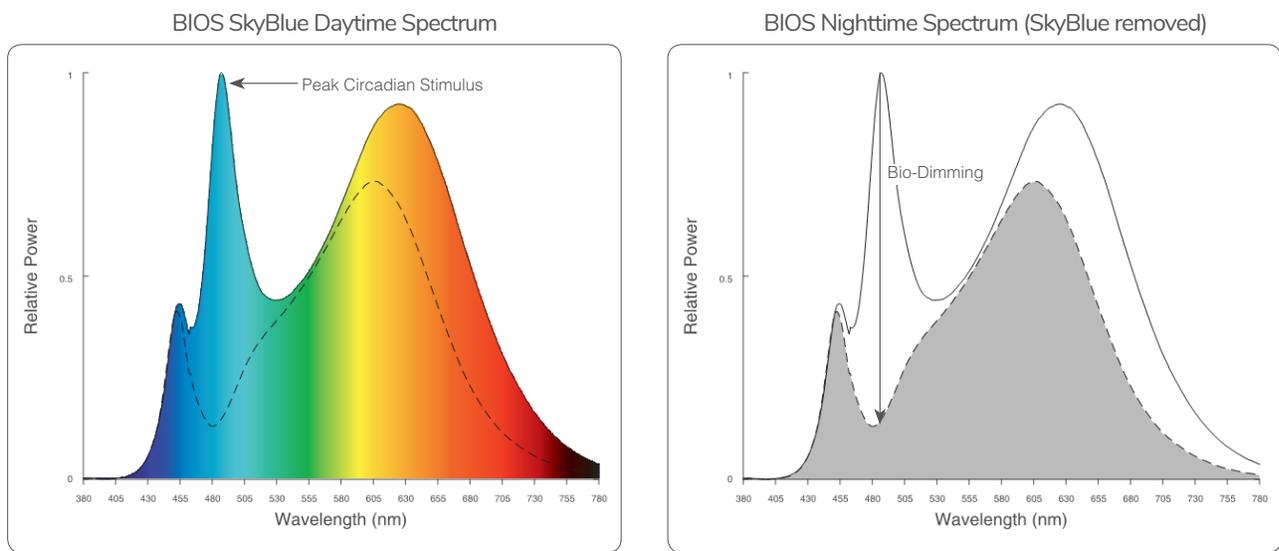
CIRCADIAN LIGHTING

CONTROLS PROTOCOL

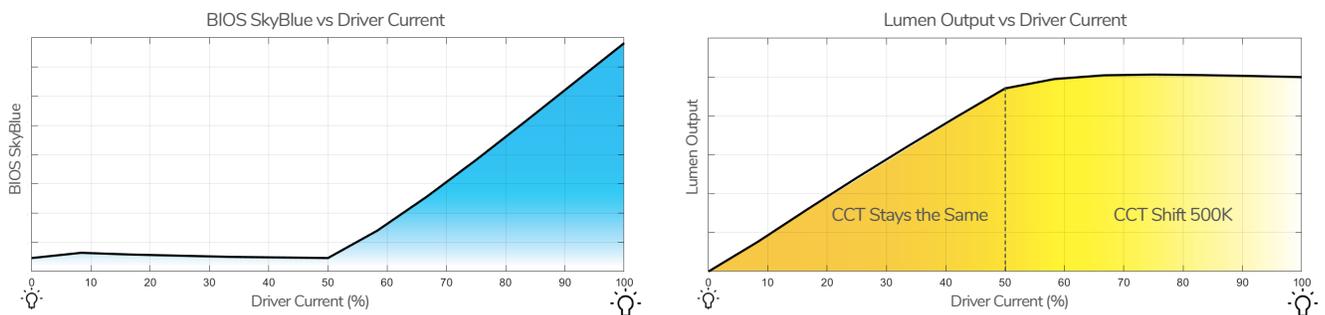
BIOS® DYNAMIC WHITE LED

The SkyBlue® Dynamic Light Engine automatically calibrates the light level, reducing melanopic lux while keeping photopic lux at a constant. When paired with the BIOS Bio-Dimming module it operates using any single channel CC LED driver and any dimming interface. BIOS is pleased to offer SkyBlue lighting solutions in 3000K (dim to 2700K), 3500K (dim to 3000K), and 4000K (dim to 3500K).

SPECTRAL POWER DISTRIBUTION - DAYTIME vs NIGHTTIME



BIO-DIMMING - SKYBLUE CONTENT AND CCT





CIRCADIAN LIGHTING

CONTROLS PROTOCOL

DIMMER SETTINGS WITH BIOS TECHNOLOGY

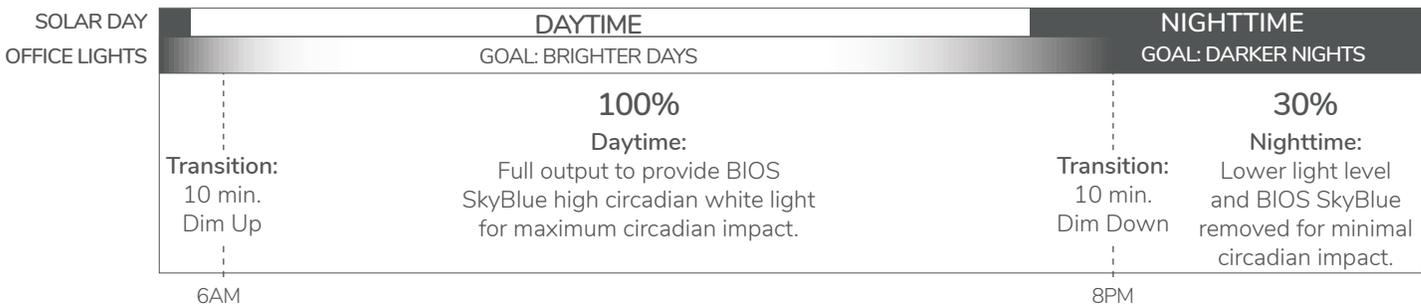
	DIMMER SETTING*	BIOS® SKYBLUE®	LIGHT OUTPUT	
	100%* (Full On)	100%	100%	BIOS SkyBlue spectrum is maintained for <u>maximum circadian impact</u> , while light output remains relatively consistent.
	99%-51%	0-100%	100%-90%	
	50%	NO BIOS	~90%	BIOS SkyBlue spectrum removed to provided <u>minimal circadian impact</u> , while light output dims linearly.
	49%-0%	NO BIOS	LINEAR DIMMING	

*Note: Bio-dimming learns individual brightness preferences and maximizes BIOS® SkyBlue® accordingly. Dimmer setting percentages as shown are relative to this learned maximum brightness set point. For more information, please see "BIOS Learning Overview" or go to www.bioshumanlight.com.

BIOS OPTIMAL CIRCADIAN LIGHTING PROTOCOL

Energy saver protocol offers a lighting control strategy for circadian stimulus while also reducing energy use over the course of the day by providing SkyBlue signals at the beginning and end of each day. Energy Saver Protocol does not provide sustained circadian stimulus and therefore . This is a good strategy if energy use must be further reduced during daytime hours of operation.

BIOS recommends all dimming transitions to be set to at least 10 minutes. The Energy Saver Protocol should allow the lighting system to dim up to full output around 7am and remain at that level until 10am. At 10am the lights should dim down to 50% light output and remain at that level until 4pm. At 4pm the lights should dim up to full output until 7pm where they should then dim down to 30% output until 7am.



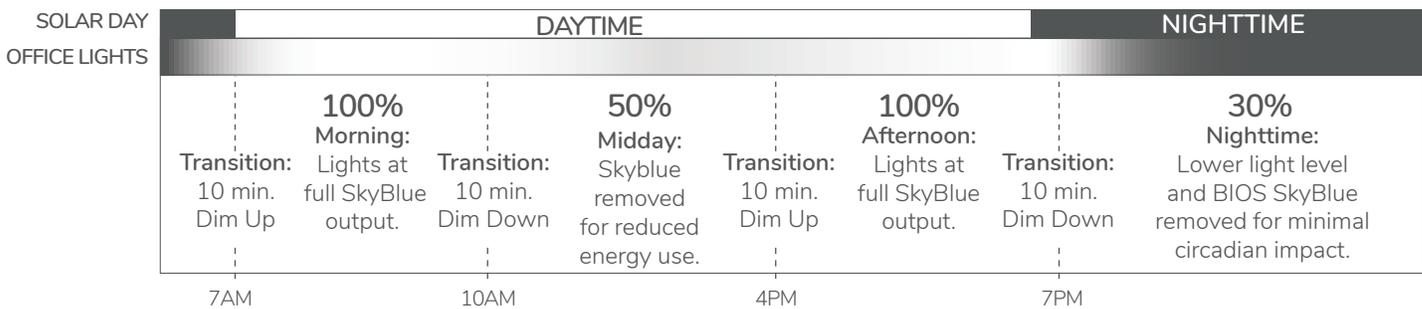


CIRCADIAN LIGHTING CONTROLS PROTOCOL

BIOS RECOMMENDED PROTOCOL - ENERGY SAVER

Energy saver protocol offers a lighting control strategy for circadian stimulus while also reducing energy use over the course of the day by providing SkyBlue signals at the beginning and end of each day. Energy Saver Protocol does not provide sustained circadian stimulus and therefore . This is a good strategy if energy use must be further reduced during daytime hours of operation.

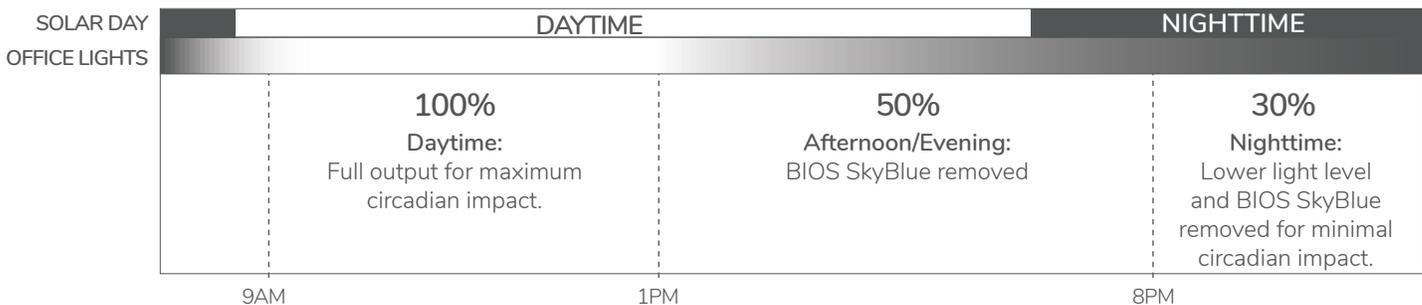
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WELL BUILDING STANDARD

The following illustrates a basic lighting control schedule needed to comply with the requirements for the WELL Building Standard Circadian Lighting Feature. For almost all program types v1 and v2 of The WELL Building Standard require that Circadian Lighting is implemented for at least 4 hours a day from the hours of 9am to 1pm.

Note: The following does not outline the lighting schedule to comply with WELL v1 Feature 54 Part 1b for Work Areas or Parts 3a or 4a for Breakrooms and Living Environments. Parts 1b, 3a, and 4a require “maintained” light exposure.

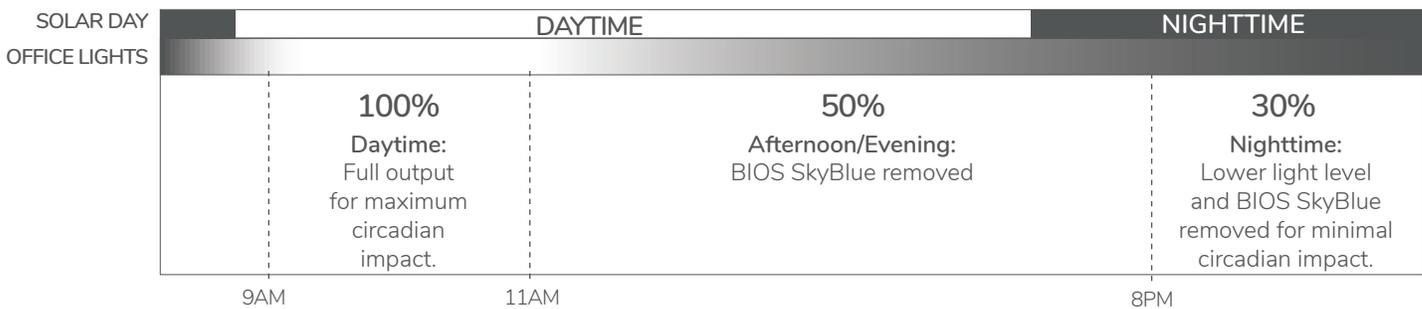




CIRCADIAN LIGHTING CONTROLS PROTOCOL

LIGHTING RESEARCH CENTER + CIRCADIAN STIMULUS MODEL

The following illustrates a basic lighting control schedule which meets the recommendations of the Lighting Research Center (LRC) and the Circadian Stimulus (CS) Model. To meet the requirements of the CS Model, the LRC recommends implementing circadian lighting for at least 2 hours a day (in the morning) from the hours of 9am to 11am.



Frequently Asked Questions

Does protocol change with the seasons?

No. The main culprit of negative health consequences are due largely to social jet lag. Social jet lag occurs when our activity patterns no longer align with the solar day. Social jet lag is common in modern society and is especially prevalent during winter months when daylight hours are very short, and we still need to be active during hours of darkness. BIOS does not recommend lighting protocols/scenes that mimic the seasons.

Should I use an astronomical timeclock?

Yes, you can use an astronomical clock for solar synchronization. However, you should be careful to ensure that short days during the winter won't encroach normal working hours. When this happens, we recommend a set hour schedule rather than astronomical clocks and solar synchronization.