

# BIOS Dynamic SkyBlue™

## Bio-Dimming™ Lighting Control Protocol

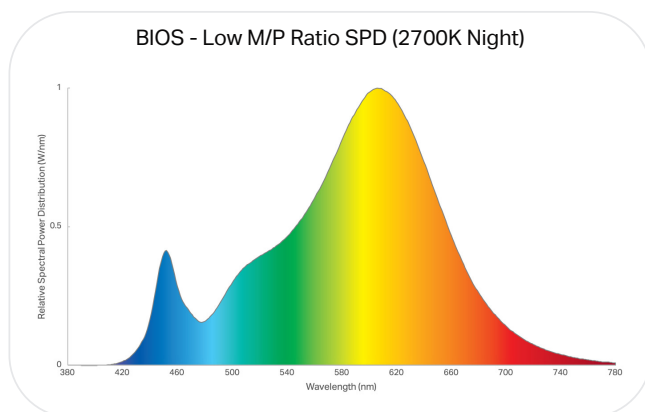
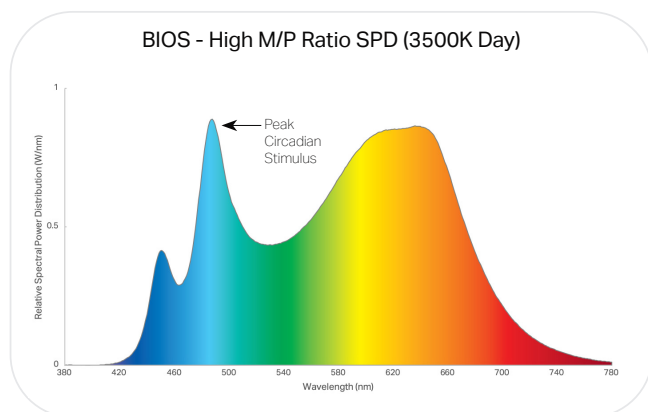
### DW DAY WORKING ENVIRONMENTS

#### BIOS Dynamic SkyBlue™ Circadian Solutions + Bio-Dimming™

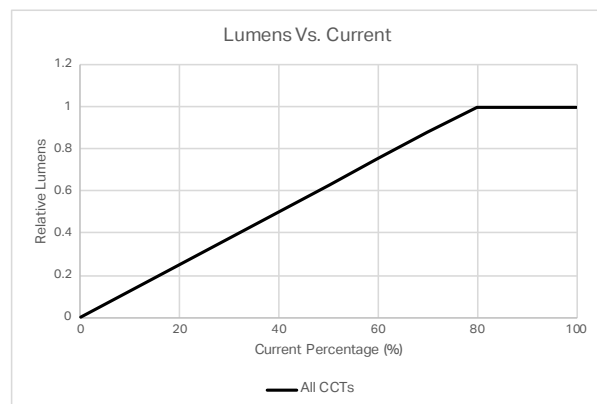
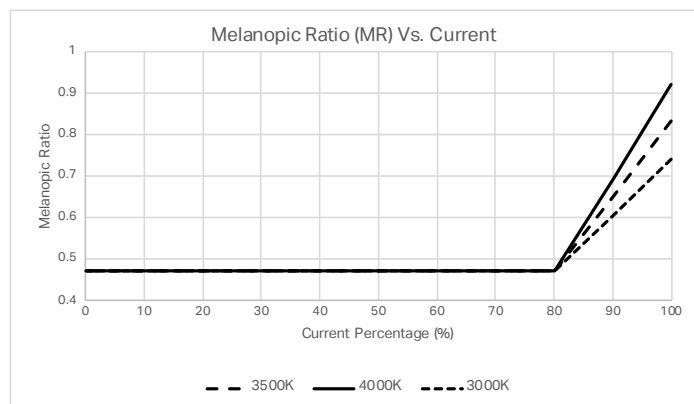
BIOS Dynamic SkyBlue™ circadian solutions provide a brilliant white light that is optimized for vision and circadian needs. BIOS is pleased to offer Dynamic SkyBlue Linear Arrays, Tape Light, and Chip-on-Board (COB) in 3000K, 3500K, and 4000K with Bio-Dimming™.

BIOS Dynamic SkyBlue circadian solutions are dimmable and feature a simple approach to circadian lighting controls. When paired with the BIOS Bio-Dimming module, they operate using any single-channel constant current (CC) LED driver, can be used with any standard dimming interface/protocol (0–10 V, ELV, DMX, DALI, wireless), and could work with existing two-channel control systems as well.

#### Spectral Power Distribution



#### Bio-Dimming – Melanopic Ratio and Lumen Output



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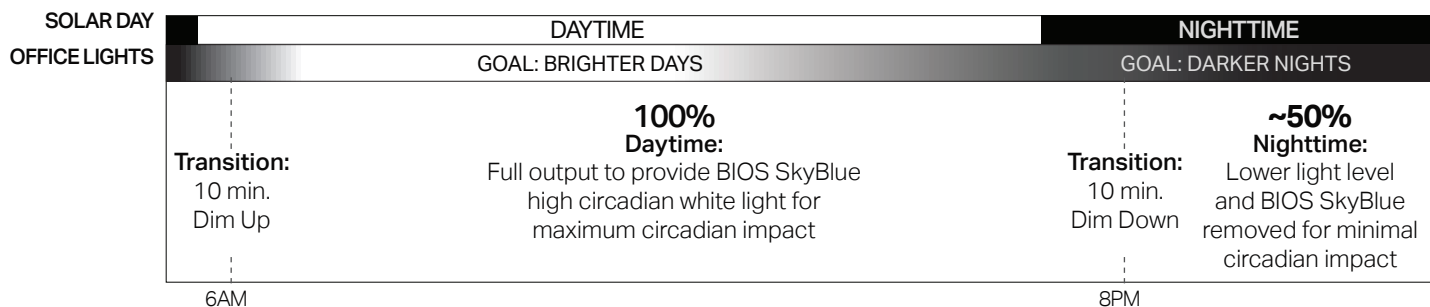
#### Dimmer Settings with Bio-Dimming™

		DIMMER SETTING*	BIOS SKYBLUE™	LIGHT OUTPUT	
		100%* (Full On)	100%	100%	Bio-Dimming™ BIOS SkyBlue™ <u>maintained</u> for maximum circadian impact. Light output remains constant.
		99%-81%	100%-0%	100%	
		80%	NO BIOS	100%	Intensity Dimming BIOS SkyBlue™ <u>removed</u> to provide minimal circadian impact. Light output dims down linearly.
		79%-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 "What to Expect from the BIOS Bio-Dimmer Machine Learning System" or go to [www.bioslighting.com](http://www.bioslighting.com).

#### BIOS Optimal Circadian Lighting Protocol

For day-working people, circadian lighting control strategies should focus on creating brighter biological daytime signals. BIOS recommends setting the lighting system to dim up in the morning over the course of 10 minutes to full-on around 6am (or sunrise). During the day the lights should remain at their full output until 8pm in the evening (or sunset), wherein they should dim down below the 80% threshold to remove the BIOS SkyBlue spectrum and provide a circadian-depleted light source and lower light levels.



Note: BIOS recommends lengthening the solar day, but not shortening it. This means, in the winter BIOS lighting should be used to provide circadian daytime signals beyond the hours that the sun is up (for most latitudes) to correspond with daily activity; and in the summer, BIOS lighting should provide circadian daytime signals for the hours that the sun is up.

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#### 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.

##### **Almost all program types for both WELL v1™ and WELL v2™ require Circadian Lighting to be implemented for a minimum of only 4 hours during the daytime (before 1pm). Why does the BIOS Optimal Circadian Lighting Protocol recommend a much longer time frame?**

The WELL 4-hour criterion is one based on the concept that “daytime lighting” compromises comfort in favor of lighting that is too bright or has an undesirable CCT, or that these light levels waste energy. BIOS however has striven to provide the daytime circadian stimulation you need in a color temperature you want—in an energy-efficient manner without making the space too bright.

##### **Should I use a “Static” or a “Dynamic” lighting control protocol setting?**

The “Static” setting is most suitable for places which people will only occupy from 6am to 8pm (such as schools, 9-5 offices, etc.). The “Dynamic” setting is for locations where the space may be occupied after 8pm or before 6am.

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##### **Can I do “daylight harvesting” with the Bio-Dimmer?**

Yes, SkyBlue™ replicates the benefits of being outside. However, if it can be replaced with actual daylight, then that is always the preferred option!

##### **Does the BIOS Bio-Dimming system require commissioning?**

In most cases, commissioning is not required. However, if the intensity of the light fixtures needs to be fine-tuned, then a simple commissioning step needs to be completed in order for the Bio-Dimmer to work with the new intensity set points.

For more information, please refer to the separate BIOS Commissioning & Troubleshooting Guide.

##### **Where can I find some research and case studies?**

<https://bioslighting.com/human/research/>

<https://bioslighting.com/case-studies/>