

BIOS Dynamic SkyBlue™

Bio-Dimming™ Lighting Control Protocol

SW SHIFT WORK ENVIRONMENTS

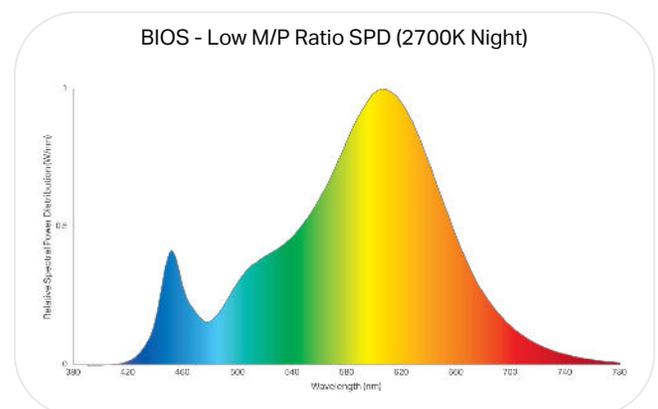
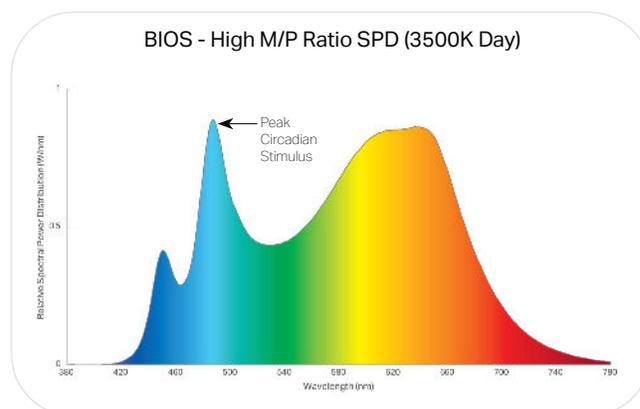
BIOS Circadian Lighting Control Protocol for Shift Work is designed for spaces that are occupied continuously over a 24-hour period, such as hospitals, security facilities, behavioral health, etc. Whether you have 2 or 3 shifts, BIOS Dynamic SkyBlue™ circadian lighting solutions provide SkyBlue signals over an extended daytime period to help each shift achieve circadian stimulus for a portion of their relative 'daytime' and activity periods.

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

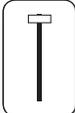
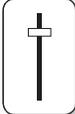
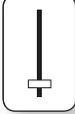


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Dimmer Settings with Bio-Dimming™

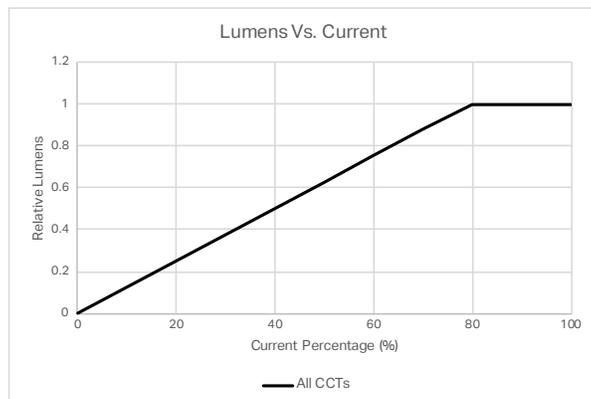
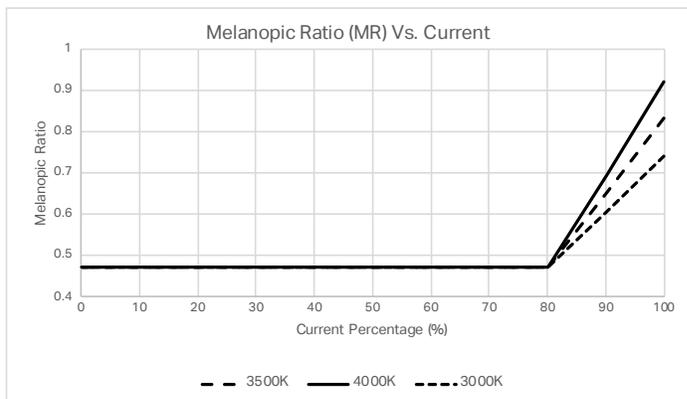
| | | DIMMER SETTING* | BIOS SKYBLUE™ | LIGHT OUTPUT | |
|--|--|--------------------|---------------|----------------|-------------------|
|  |  | 100%* (Full On) | 100% | 100% | Bio-Dimming™ |
|  |  | 99%-81% | 100%-0% | 100% | |
|  |  | 80% | NO BIOS | 100% | Intensity Dimming |
|  |  | 79%-0% | NO BIOS | LINEAR DIMMING | |

BIOS SkyBlue™ maintained for maximum circadian impact.
Light output remains constant.

BIOS SkyBlue™ removed to provide minimal circadian impact.
Light output dims down linearly.

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.

Bio-Dimming – Melanopic Ratio and Lumen Output



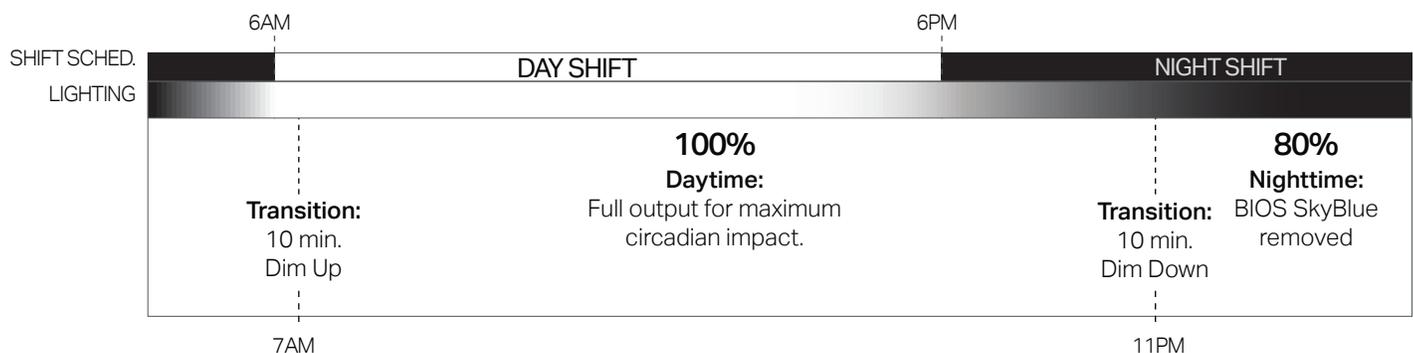
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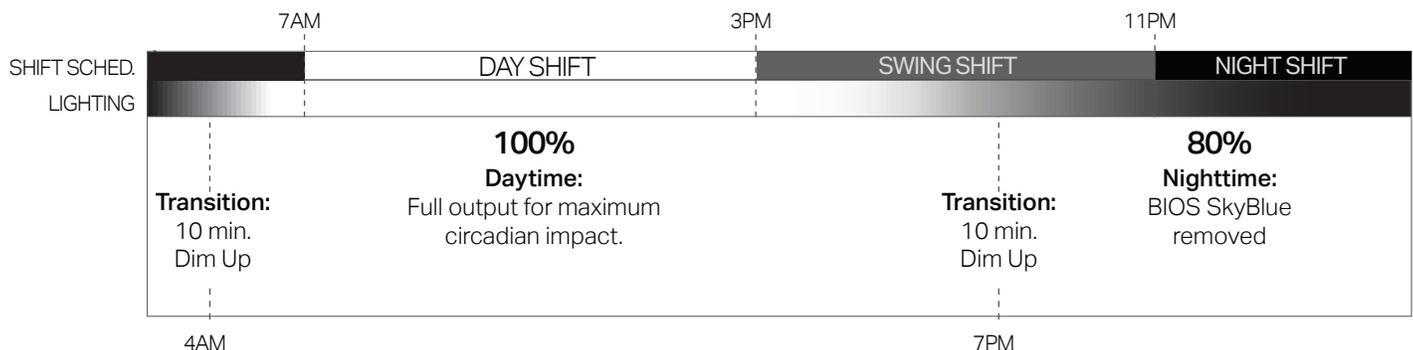
BIOS Shift Work Protocol – (2) 12hr Shifts

For businesses whose operations require two (2) shifts, the lighting system should be at full output in the morning, about an hour after the Day Shift begins, and continue to provide SkyBlue™ signals well into the evening as shown in the diagram below. In the late evening, the lighting controls should dim to 80%, removing the SkyBlue signals. This extended period of high circadian stimulus ensures that people from both shifts receive proper daytime signals, while allowing the Night Shift a period of low circadian stimulus as well.



BIOS Shift Work Protocol – (3) 8hr Shifts

For businesses whose operations require two (3) shifts, the lighting system should be at full output beginning in the early morning, at the end of the Night Shift and before the Day Shift arrives. High circadian stimulus should be maintained until the evening, several hours into the Swing Shift, and then the lighting controls should dim to 80%, removing the SkyBlue™ signals. This extended period of high circadian stimulus ensures that people from all shifts receive proper daytime signals while allowing the Night and Swing Shifts a period of low circadian stimulus as well.



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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?

No, since the goal for shiftwork applications is to deviate from the natural cycle. The protocol set forth here is based on research to promote better productivity while on shift and better sleep while off shift.

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?

WELL does not define any protocols for shift work. Our recommendation in this document is based on the latest scientific literature on shift work.

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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Frequently Asked Questions

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/>