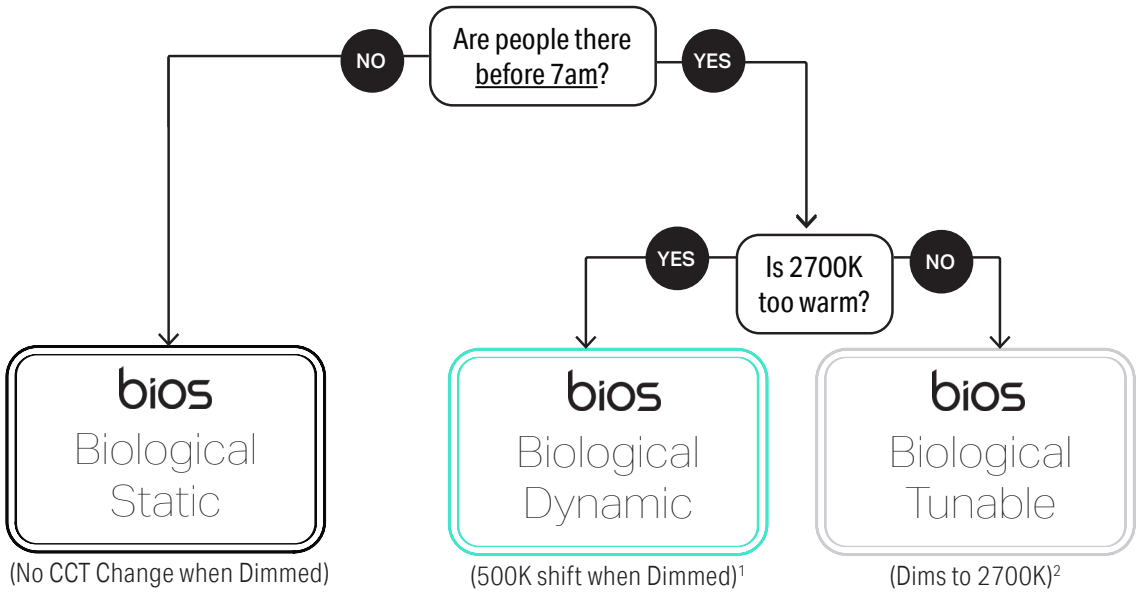
WHEN TO USE BIOS
WELLNESS LIGHTING

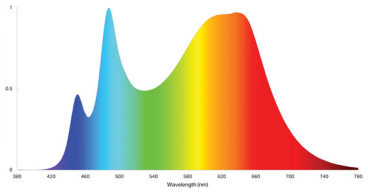
Choosing Your BIOS Solution

Kenall offers three (3) different BIOS Circadian LED Solutions — Biological Static, Biological Dynamic, and Biological Tunable White. BIOS engineers LED technology for wellness and circadian rhythms and Kenall partners with them to provide BIOS Illuminated architectural light fixtures.

Use the simple decision tree below to identify when and where to use BIOS Wellness LED Lighting Solutions and be sure to visit our website for more detailed information *www.bioslighting.com*.

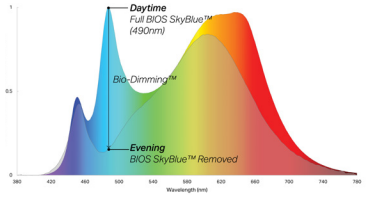
Note: This document provides BIOS recommendations for Circadian Wellness LED Lighting Solutions. BIOS recommends these solutions because they are simple to use, cost-effective, and have the greatest biological impact.





Daytime Solution
(Offices, Medical/Dental Offices)

Spaces in operation during daytime hours, between 7am and 7pm

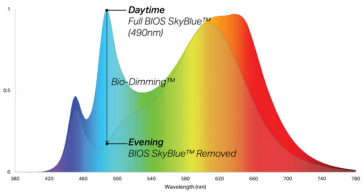


Daytime + Evening Solution
(Offices, Shiftwork)

Spaces in operation ***overnight***, after 7pm and before 7am

CCT color shift in the evening not preferred

[1] 3000K dims to 2700K



Daytime + Evening Solution
(Hospitals)

Spaces in operation overnight, after 7pm and before 7am

CCT color shift in the evening is preferred

[2] BIOS Biological Tunable is compatible with two-channel applications. For two-channel application notes please visit our website under Partner Resources > Technical Specifications.

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HOW TO SPECIFY BIOS

WELLNESS LIGHTING

Unsure where to start when specifying circadian, human-centric, or wellness lighting?
Simply copy/paste the text below to include in your lighting specification package, fixture schedule, or 26 5100 spec section. Please note: The information below highlights BIOS Circadian LED source performance and provides spec information for each CCT and BIOS technology type.

bios Biological Static

(No CCT Change when Dimmed)

- 3000K LED source with blue spectrum peak emission at 490nm and daytime melanopic ratio (m-EER)* of at least 0.70 or (m-DER) of at least 0.63, CRI 80+ and R9>90.
- 3500K LED source with blue spectrum peak emission at 490nm and daytime melanopic ratio (m-EER)* of at least 0.80 or (m-DER) of at least 0.72, CRI 80+ and R9>90.
- 4000K LED source with blue spectrum peak emission at 490nm and daytime melanopic ratio (m-EER)* of at least 0.90 or (m-DER) of at least 0.81, CRI 80+ and R9>90.

* Melanopic ratios are provided in two (2) formats: They are shown as (m-EER) which is calculated using the WELL v2 methodology, and the corresponding CIE melanopic Daylight Equivalent Ratios (m-DER) are provided as well.

bios Biological Dynamic

(500K shift when Dimmed)

- LED source with 3000K high melanopic daytime spectrum and 2700K low melanopic evening spectrum controlled using a single-channel driver.
  Daytime Spectrum: 3000K with blue spectrum peak emission at 490nm and daytime melanopic ratio (m-EER)* of at least 0.70 or (m-DER) of at least 0.63, CRI 80+ and R9>90. Evening Spectrum: 2700K with maximum melanopic ratio (m-EER) 0.47 or (m-DER) of 0.42.
- LED source with 3500K high melanopic daytime spectrum and 3000K low melanopic evening spectrum controlled using a single-channel driver.
  Daytime Spectrum: 3500K LED with blue spectrum peak emission at 490nm and daytime melanopic ratio (m-EER)* of at least 0.80 or (m-DER) of at least 0.72, CRI 80+ and R9>90. Evening Spectrum: 3000K LED with maximum melanopic ratio (m-EER) 0.49 or (m-DER) of 0.44.
- LED source with 4000K high melanopic daytime spectrum and 3500K low melanopic evening spectrum controlled using a single-channel driver.
  Daytime Spectrum: 4000K LED with blue spectrum peak emission at 490nm and daytime melanopic ratio (m-EER)* of at least 0.90 or (m-DER) of at least 0.81, CRI 80+ and R9>90. Evening Spectrum: 3500K LED with maximum melanopic ratio (m-EER) 0.57 or (m-DER) of 0.51.

bios Biological Tunable

(Dims to 2700K)

- LED source with 3000K high melanopic daytime spectrum and 2700K low melanopic evening spectrum controlled using a single-channel driver.
  Daytime Spectrum: 3000K with blue spectrum peak emission at 490nm and daytime melanopic ratio (m-EER)* of at least 0.70 or (m-DER) of at least 0.63, CRI 80+ and R9>90. Evening Spectrum: 2700K with maximum melanopic ratio (m-EER) 0.47 or (m-DER) of 0.42.
- LED source with 3500K high melanopic daytime spectrum and 2700K low melanopic evening spectrum controlled using a single-channel driver.
  Daytime Spectrum: 3500K LED with blue spectrum peak emission at 490nm and daytime melanopic ratio (m-EER)* of at least 0.80 or (m-DER) of at least 0.72, CRI 80+ and R9>90. Evening Spectrum: 2700K LED with maximum melanopic ratio (m-EER) 0.47 or (m-DER) of 0.42.
- LED source with 4000K high melanopic daytime spectrum and 2700K low melanopic evening spectrum controlled using a single-channel driver.
  Daytime Spectrum: 4000K LED with blue spectrum peak emission at 490nm and daytime melanopic ratio (m-EER)* of at least 0.90 or (m-DER) of at least 0.81, CRI 80+ and R9>90. Evening Spectrum: 2700K LED with maximum melanopic ratio (m-EER) 0.47 or (m-DER) of 0.42.

WHAT IS BIOS SKYBLUE™ (490NM)?

BIOS SkyBlue™ Technology brings the benefits of blue skies inside. BIOS SkyBlue is *the only* circadian lighting technology that includes a blue peak at 490nm.

BIOS SkyBlue Technology pinpoints the peak sensitivity of the human circadian system — providing the most effective daytime circadian signal and giving you the industry's highest melanopic ratios using standard architectural color temperatures.

BIOS Biological Dynamic and Biological Tunable LED Circadian Lighting Solutions are designed to dynamically shift from day to night via a common dimmer (0-10V, DALI, etc.). Simply dim the lights 2 to 3 hours before bedtime to promote a healthier circadian rhythm and a better night's sleep.

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