

Color Match Approval Under Multiple Light Sources

1.0 Maintenance Objective & Frequency

The objective of this procedure is to ensure that the light booth used for color match approval is operating within specified illuminance and color temperature tolerances, and that operators follow a standardized visual evaluation protocol under D65 (daylight), A (incandescent), and TL84 (fluorescent) light sources. This prevents metamerism mismatches and reduces customer rejections due to off-color parts.

Frequency: Perform this calibration and verification procedure weekly, or immediately following any reported lamp failure, color mismatch dispute, or after 2000 hours of accumulated lamp use (whichever comes first).

2.0 Lockout/Tagout (LOTO) & Safety

- **Electrical Isolation:** Disconnect the light booth from mains power by unplugging the unit or switching the dedicated circuit breaker to OFF. Apply a personal lock and tag.
- **Thermal Hazard:** Allow lamps to cool for a minimum of 10 minutes before handling to prevent burns.
- **UV Exposure:** Do not look directly at illuminated lamps. Use UV-blocking safety glasses if working near the booth during operation.
- **PPE:** Wear clean, lint-free gloves when handling lamps or interior booth surfaces to avoid contamination that could affect light output or color reflection.

3.0 Required Tools, Parts & Lubricants

- Calibrated spectroradiometer or colorimeter (e.g., X-Rite i1Pro 2 or equivalent) with current calibration certificate
- White reflectance standard (barium sulfate or PTFE-based, traceable to NIST)
- Replacement lamps: D65 (6500K), A (2856K), TL84 (4000K) – OEM specified part numbers
- Lint-free microfiber cloth and isopropyl alcohol (99% purity)
- Digital timer or stopwatch
- Personal lock and tag for LOTO
- ServiceGrid work order tablet or clipboard with approved color standard samples

4.0 Step-by-Step Maintenance Procedure

1. **Perform LOTO:** Disconnect the light booth from mains power. Apply personal lock and tag. Wait 10 minutes for lamps to cool.
2. **Inspect and clean the booth interior:** Using a lint-free cloth dampened with isopropyl alcohol, wipe all interior surfaces (walls, floor, back panel) to remove dust and residue. Do not use abrasive cleaners. Inspect for any cracks, discoloration, or damage to the matte gray (Munsell N7) paint. If damaged, repaint per OEM specification.
3. **Inspect lamps:** Remove the diffuser panel (if present) and visually check each lamp for blackening at the ends, flickering, or physical damage. Replace any lamp that shows signs of end-of-life or has exceeded 2000 hours of operation. Record lamp serial numbers and installation date in ServiceGrid.

4. Install replacement lamps (if needed): Using clean gloves, install new lamps of the correct type (D65, A, TL84). Ensure lamps are fully seated in their sockets. Do not touch the glass envelope with bare hands; if contaminated, clean with isopropyl alcohol and let dry.
5. Reassemble the booth: Replace the diffuser panel and any protective covers. Ensure all fasteners are snug but not over-torqued.
6. Restore power and warm up: Remove LOTO, reconnect power, and turn on the light booth. Allow lamps to stabilize for a minimum of 15 minutes (30 minutes for new lamps) before taking measurements.
7. Measure illuminance and color temperature: Using the calibrated spectroradiometer, measure the illuminance (lux) and correlated color temperature (CCT) at the center of the work surface, 18 inches from the lamp plane. Record readings for each light source (D65, A, TL84) individually. Acceptable tolerances: D65: 6500K $\pm$ 200K, 2000 lux $\pm$ 200 lux; A: 2856K $\pm$ 100K, 1500 lux $\pm$ 150 lux; TL84: 4000K $\pm$ 200K, 1800 lux $\pm$ 200 lux. If any reading is out of tolerance, replace the corresponding lamp and re-measure.
8. Verify uniformity: Measure illuminance at four corners and the center of the work surface under D65. The maximum variation between any two points must not exceed 15%. If uniformity fails, inspect lamp alignment and diffuser condition; replace components as needed.
9. Perform a visual color match check: Place a known approved color standard (e.g., a Pantone chip or production-approved sample) next to a production part under D65. Have two trained operators independently evaluate the match at a 45-degree viewing angle, 18 inches from the sample. Both operators must agree that the match is acceptable (no perceptible difference). Repeat under A and TL84. If any operator rejects the match, investigate the part and the booth before approving.
10. Document results: Record all measurements, lamp hours, operator names, and pass/fail status in the ServiceGrid PM work order. Attach any digital photos of the booth setup if required by your quality system.

5.0 Verification & Return to Service

1. Confirm that all illuminance and CCT measurements are within the tolerances listed in Section 4. If any measurement is out of spec, do not return the booth to service until corrective action (lamp replacement, cleaning, or repair) is completed and re-verified.
2. Ensure that the visual color match check passed under all three light sources (D65, A, TL84) with agreement from both operators.
3. Remove all test samples and standards from the booth. Clean the work surface with a lint-free cloth if any residue is present.
4. Sign off on the ServiceGrid work order, confirming that the booth is calibrated and ready for production use. Update the lamp hour counter (if applicable) or reset the timer for the next PM interval.
5. Notify the quality department and production supervisor that the light booth is available for color match approvals.

Regulatory Disclaimer: This document is a generic maintenance template provided for educational and informational purposes only. It does not constitute professional engineering or reliability advice. The end-user assumes all liability for validating all step sequences, torque specs, and LOTO protocols against specific machinery OEM manuals before deployment to a live production floor.