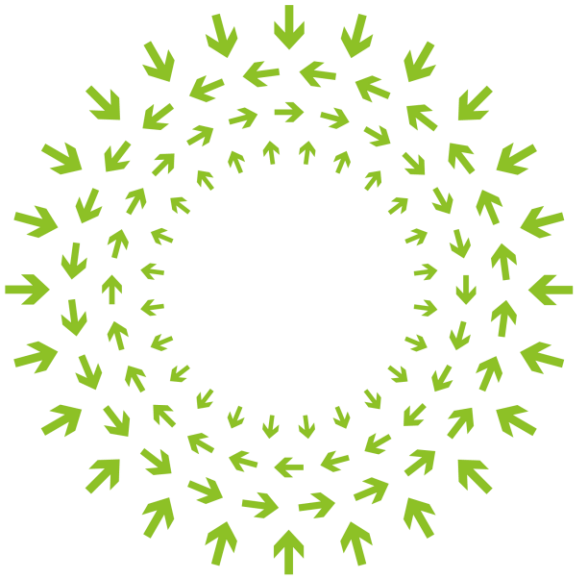

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Compute Project

Draft Panel Indicator Specification

Version 1.0

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2 Introduction

Current OCP hardware uses a variety of indicators to communicate information to service technicians. In many cases, these indicators are inconsistent, conflict with various diagnostic tools, communicate information of little use, or do not accommodate color-blind data center personnel. These issues can be alleviated by developing and adopting an indicator specification that address these concerns.

3 Guiding Principles

1. The primary function of indicators is to assist data center personnel in maintaining, servicing, or repairing data center equipment. Any indicators that exist solely to serve hardware teams during product development should be removed or deactivated before mass production.
2. The total set of permitted indicator behaviors and colors should be as simple as possible.
3. Indicators should not conflict with other diagnostic tools.
4. An indicator should communicate a clear message. A “decoder ring” should not be necessary.
5. Indicators should be consistent in behavior, colors, nomenclature, and graphics – both within and across all OCP products.
6. Indicators should do one or more of the following: provide component status, guide personnel to components that require service and/or identify actionable issues.
7. Indicators should conform to a constrained pallet of colors, be easily viewable, and accommodate users with color perception deficiencies.

4 General Rules

4.1 Indicator Colors

1. **Blue** and **amber** (yellow) are the permitted indicator colors. These two colors are easy to distinguish from each other for persons with the most common type of color perception deficiency.
2. Each color has a defined set of meanings and wavelengths. One or more meanings may be relevant, depending on the context:

Table 1. Permitted indicator colors

Color	Meaning(s)	Nominal Value (nm)	Acceptable Range (nm)
Blue	Power On, Functioning, Status Good, Link, Active	470	445-480
Amber	Fault, Locate	590	580-600

4.2 Indicator Intensity

1. The luminosity requirement depends on the indicator implementation. The luminosity of any light pipe viewing surface shall be controlled within the parameters below:

Table 2. Permitted luminosity of light pipes

Color	Nominal Value (Cd/m^2)	Acceptable Range (Cd/m^2)
Blue	1000	850-1150
Amber	2000	1700-2300

2. When LEDs with integrated glass viewing surfaces are used, the luminous intensity shall be controlled within the parameters below:

Table 3. Permitted intensity

Color	Nominal Value (mCd)	Minimum (mCd)
Blue	10	8
Amber	15	12

3. The required visible view angle of any indicator shall be ±40 degrees horizontally and vertically. The luminosity within the view angle above shall be controlled within ±25% of the nominal spec value above. When possible, the vertical view angle should be ±55 degrees.
4. Light pipe viewing surfaces shall receive texture to control brightness variance across the surface.
5. Indicators should not cause color-bleed or cross-talk in adjacent indicators. The cross-talk should not cause an increase of more than 20 Cd/m^2 in an adjacent indicator.

4.3 Indicator Behaviors

Indicators should be constrained to the following three behaviors:


OFF
ON (Steady on)
BLINK (1 Hz rate – 0.5s On, 0.5s Off)

Note: The blue LED graphic only serves as an example.

These behaviors only have meaning when they are combined with an indicator color, as will be shown in the *Permitted Indicator States* section.

4.4 Indicator Placement

1. All system or module status should be communicated with a pair of blue and amber indicators. For example, every fan module should have a blue indicator for Power/OK, and a separate amber indicator for Fault/Locate.
2. Indicator pairs must be arranged as: blue-left/amber-right, or blue-above/amber-below.
3. Paired indicators should be near each other while allowing for printed legends, and other panel features.
4. Whenever possible, indicators should not be closer than 6mm from one another (edge to edge).
5. Where space is limited, a single blue/amber indicator is permitted.
6. If more than one type of fault condition is to be communicated, additional amber indicators are permitted. They are to be to the right of, or below, the amber Fault/Location indicator.
7. For modules that are not visible from the front panel of a system, indicators for those modules should appear on the front panel of the system, via light pipes, cabled connections, etc.
8. Indicators should be visible on the front or rear panel of a system when viewing the panel from a perpendicular direction.
9. Indicators should always be surrounded by a panel to reduce background visual noise and provide a location for printed legends. No bare LEDs on PCBs are permitted.

4.5 Indicator Nomenclature

1. Where possible, all indicators should be identified with a legend that is adjacent to the indicator.
2. Text should be in black Arial condensed bold font with a minimum of 2.5mm font size whenever possible.
3. Where space is limited for placement of a legend, no legend will be required. For example, LEDs on a Quad Small Form-factor Pluggable (QSFP) cage.
4. Consistent nomenclature should be maintained on indicators for all products. Below are recommended legends for the most commonly found indicators on OCP equipment:

Table 4. OCP indicator legends

Meaning	Preferred	Alternate
Power On/Good		PWR
AC Good		AC OK
DC Good		DC OK
Fault		FAULT
Status		STS
Fan		FAN
Over Temperature		OVER TEMP
Drive #		DRIVE #
End of Life Reached (BBU)	EOL	N/A

Table 5. OCP icon reference standards

Indicator Icon	Reference Standard
	IEC 60417 - 5009
	IEC 60417 - 5032
	IEC 60417 - 5031
	ISO 7010 - W001
	IEC 60417 - 6334B

5 Permitted Indicator States

Separate LEDs (preferred)		**Combined Blue/Amber LED** (use only if space is limited)	**Meaning(s) Communicated by each LED** (one or more meanings may be valid for blue LED)	
Blue	**Amber**		**Blue**	**Amber**
OFF 	OFF 	OFF 	Off/Not Functioning/Not Present. Service Action Allowed.	No Fault
ON 	OFF 	BLUE ON 	On/Functioning. Link Established – No Activity.	No Fault
BLINK 	OFF 	BLUE BLINK 	On/Functioning. Drive/Network Activity.	No Fault
OFF 	ON 	AMBER ON 	Off/Not Functioning. Service Action Allowed.	Fault
OFF 	BLINK 	AMBER BLINK 	Off/Not Functioning/Not Present. Service Action Allowed.	Locate
N/A[1]	N/A[1]	BLUE/AMBER Alternate 	On/Functioning. Firmware Update in Progress. No Service Action Allowed	

[1] Firmware Update in Progress is indicated with alternating Blue/Amber blinking LEDs. A multi-color LED is required. Blinking frequency shall be 1Hz (i.e., 0.5sec blue followed by 0.5sec amber).

6 Indicator States as Applied to Specific Hardware

6.1 System Power Control/Status

If the product has a power button, it is permissible to integrate the Blue LED with the button. There should be a separate amber LED paired with the Power LED to indicate Fault or Locate. The blue power LED should not be used for these functions.

In the Permitted States descriptions, "/" = "and/or", "+" = "with"

Table 6. System power control/status LEDs

Permitted States	Separate LEDs	
	PWR (Blue)	**FAULT/LOC** (Amber)
System Off/Service Action Allowed		
System On/Status OK		
System Off + Fault		
System On + Locate		
System Off + Locate		
System On + Fault		

6.2 System General Status

Some products, such as Backpack[2], have LEDs that indicate the overall status for particular types of modules within the system chassis. For example, a pair of status LEDs might indicate the condition of all of the fan modules, without reporting the condition of any particular fan module. In this case, the locate function is inappropriate.

Table 7. System general status LEDs

Permitted States	**Separate LEDs** (preferred)		**Combined Blue/Amber LED** (limited space)
	STS (Blue)	**FAULT** (Amber)	**STS**
All Modules (e.g Fans, PSUs, etc.) present and OK.			
One or more modules are not plugged in.			
One of more modules has a fault or alarm condition.			

6.3 Generic Module/Compute Node Status

Table 8. Generic module/compute node status LEDs

Permitted States	**Separate LEDs** (preferred)		**Combined Blue/Amber LED** (limited space)
	STS (Blue)	**FAULT/LOC** (Amber)	**STS**
Module Off/Service Action Allowed			
Module On/Status OK			
Module Off + Fault			
Module Off + Locate			
Module On + Locate			
Firmware Update in Progress	N/A	N/A	

[2] http://www.opencompute.org/wiki/Networking/SpecsAndDesigns#Facebook_Backpack_-_128x100G

6.4 PSU Status

If multiple fault conditions exist for Power Supply Units (PSUs), there should be separate amber LEDs for each type of fault that is being identified (e.g. under voltage, AC outage, etc.). In this case, the general FAULT LED should be used for the LOCATE function.

Table 9. PSU status LEDs

Permitted States				
AC	**AC OK** (Blue/Amber)	**FAULT/LOC** (Amber)	**LOW V** (Amber)	**BACK UP** (Amber)
AC OK				
AC Fault				
AC Under Voltage				
Backup due to AC Outage				
Locate				
Firmware Update in Progress				
DC	**DC OK** (Blue)	**FAULT/LOC** (Amber)	**LOW V** (Amber)	**SHUT DOWN** (Amber)
DC OK				
DC Voltage out of Regulation				
DC Shutdown				

6.5 BBU Status

Table 10. BBU status LEDs

Permitted States	Separate LEDs			
	BBU OK (Blue)	**FAULT/LOC**(Amber)	**LOW V** (Amber)	**EOL** (Amber)
Sleep				
BBU On/Available + Status OK				
BBU Fault				
BBU Under Voltage				
End of Life Reached				
BBU Off/Not OK + Locate				
BBU On/OK + Locate				

6.6 QSFP Module Status

Each QSFP module has a corresponding receive (RX) and transmit (TX) LED on the QSFP cage into which it is plugged. The table below lists the permitted states for both receive and transmit.

Table 11. QSFP module status LEDs

Permitted States (both RX and TX LEDs)	Combined Blue/Amber LED
Link is Down	
Link Established + No Activity	
Link Established + Activity	
Port Error	
Locate	

6.7 HDD

Table 12. HDD LEDs

Permitted States	Separate LEDs (preferred)		Combined
	DRIVE (Blue)	**FAULT/LOC**(Amber)	**Blue/Amber LED (limited space)** **DRIVE**
No Drive/Drive Off/Drive Not Seated/No Link			
Drive On + Link Established + No Activity			
Drive On + Link Established + Activity			
Drive Off + Fault			
Locate			

6.8 Fan Module

Table 13. Fan module LEDs

Permitted States	Separate LEDs (preferred)		Combined
	FAN (Blue)	**FAULT/LOC** (Amber)	**Blue/Amber LED** (limited space) **FAN**
Fan Off			
Fan On and is within Normal Speed Range			
Fan Off + Fault/Below Threshold Speed			
Locate			

7 LED Brightness and Wavelength Test Procedure

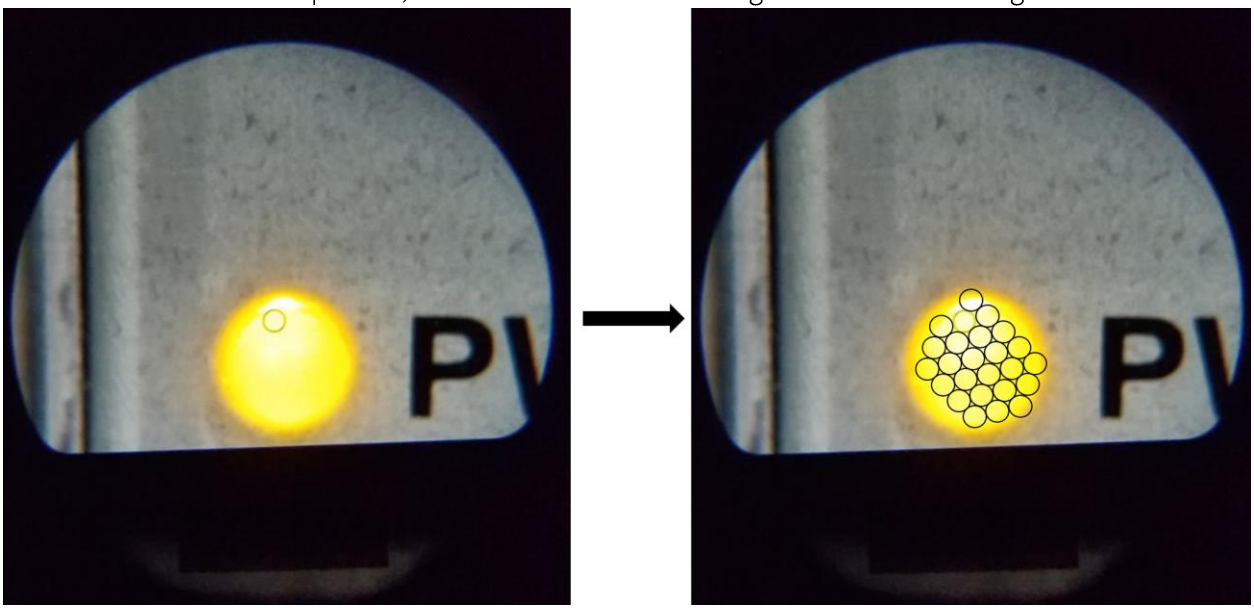
7.1 Equipment

- Konica Minolta LS-160 or equivalent
- Close-up lens No. 110 or equivalent
- Tripod with 3 axis fine adjustment

7.2 Procedure

Follow test procedure as outlined in luminosity sensor manual. For Konica Minolta LS-160:

1. Determine the required distance from the light source as dictated by the lens. The LS-160 with close-up lens #110 should be placed 214mm from the light source.
2. Adjust the viewfinder until the measuring circle is clearly visible.
3. Adjust the lens focus until the front panel is clearly visible. Note: the measuring circle for the #110 lens should appear approximately 0.5 mm in diameter when 214 mm from the light source. The measuring circle should be small enough to capture any brightness variations on the surface of the indicator.
4. Measure as many locations on the surface of the light source until the entire surface has been measured, without any overlapping measurements. This will create a grid of measurements sufficient to determine the brightness variation on the surface. Take an average of the measurements and make sure the min and max values are within the required range. Throughout the measurement process, ensure the ambient room brightness does not change.



5. Repeat this procedure at the required view angle 4 times (left, right, top, and bottom)
6. To determine the dominant wavelength present, set the luminosity sensor to wavelength mode and measure one location at the center of the indicator. When measuring wavelength, try to avoid any hot spots that might be present on the surface.