# STLogotype-GY.jpg

**Product Specification**

**DOT Series LED Blank-out Sign in IP66/NEMA 4X Cabinet**

**January 2016**

1. Construction and Operation
2. Cabinet Housing
	1. Right, left, rear and front cabinet walls shall be oriented vertically. The top and bottom sides shall be oriented horizontally. (Except when noted for “diamond” signs.)
	2. Cabinet shall protect internal components from rain, ice, and dust
	3. Primary cabinet structure shall consist of 0.125” thick 6063-T6 aluminum alloy.
	4. External hardware shall be fabricated from stainless steel suitable for outdoor sign applications.
	5. Structural assembly hardware shall be stainless steel, aluminum, or galvanized steel, and must be appropriately sized for the application. Assembly hardware includes all nuts, bolts, washers, and latches.
3. Cabinet Interior
	1. All components shall be placed to avoid drip points.
	2. All writing shall incorporate drip loops and strain relief
4. Cabinet Finish
	1. The cabinet shall have a powder coated finish.
	2. The finish shall meet the following criteria:
		1. 60° Gloss 5% ±5% per ASTM D523
		2. Pencil Hardness 2Hper ASTM D523
		3. Flexibility 100% D1737/D522
		4. Direct Impact 80min in lbs @2.5 mils per ASTM D2794
		5. Reverse Impact 80min in lbs @2.5 mils per ASTM D2794
		6. Salt Spray 1000 Hours Typical per ASTM D1654
5. Lifting Hardware
	1. When needed, multiple galvanized steel lifting eyebolts shall be mounted to the top of the cabinet. Eyebolt hardware shall attach directly to the cabinet frame, and is installed at the factory.
	2. All mounting points of eyebolts shall be sealed to prevent water from entering the cabinet. Lifting hardware, as well as the cabinet frame, shall be designed such that the cabinet can be shipped and handled without damage or excessive stress before or during installation to its support structure.
6. Welding
	1. All exterior seams shall be continuous TIG welded to form a single structure.
	2. All welds shall be performed to the documented in-house welding procedures
	3. The welds shall be performed by certified welders and inspected by a certified welder.
7. Chemical Bonding
	1. In some instances, a chemical bonding agent is the preferred method of assembly. In these cases, a two-part adhesive will be permitted. All necessary testing shall be completed to the adhesive manufacturer’s specifications.
8. Hinged Face Construction
	1. Hinged Face shall be attached to cabinet using a full-length extruded hinge.
	2. The cabinet face shall be flanged on all sides to shed water. The door shall close around its flanged frame and compress against a closed-cell silicone gasket, which is adhered to the door. The door shall contain a positive stop that prevents the door from being opened beyond 90° open position.
	3. Front frame shall consist of a replaceable 0.25” tinted polycarbonate protective face.
	4. The polycarbonate shall cover the entire frame opening and will be sealed to prevent water and other elements from entering the cabinet by 2 rounds of ¼” closed-cell silicone gasket.
	5. The polycarbonate shall contain UV inhibitors to protect the circuit board from the effects of ultraviolet light and prevent the premature aging of the polycarbonate face.
	6. The polycarbonate face shall have the following characteristics:
		1. Rockwell Hardness: M70, R118 ASTM D785
		2. Light Transmission: 86% @ 0.125” ASTM D1003
		3. Refractive Index: 1.586 @ 77°F ASTM D542A
		4. Tensile Strength, Ultimate 9,500 psi ASTM D638
		5. Tensile Strength, Yield: 9,000 psi ASTM D638
		6. Tensile Modulus: 340,000 psi ASTM D638
		7. Flexural Strength, Yield: 13,500 psi ASTM D790
		8. Flexural Modulus: 345,000 psi ASTM D790
		9. Impact Strength, Izod: 18 ft-lbs/inch ASTM D256A
		10. Heat Deflection Temperature: 270°F@264psi ASTM D648
		11. Coefficient of Thermal Expansion: 2.75 x 10-5 ASTM D696
9. LED Circuit Boards
	1. General
		1. LED circuit boards shall be manufactured using an FR-4 laminated fiberglass/epoxy printed circuit board with the front face printed with black UV cure ink or black paint.
		2. The failure of an LED string shall not cause the failure of any other LED string.
		3. The circular base of the discrete LEDs shall be soldered such that they are flush.
		4. Exposed traces, vias, and solder joints on the LED circuit board, with the exception of connector contacts and terminals, shall be protected from water and humidity by application of conformal coating.
		5. The conformal coating shall contain a UV brightener to aid in visual inspection.
		6. The presence of ambient radio signals, magnetic interference, and electromagnetic interference shall not impair the performance of the sign system. Interference includes power lines, transformers, and motors. The sign will not radiate electromagnetic signals that adversely affect any other electronic devices, including those located in vehicles passing underneath or near the sign and its’ controller.
		7. The Cabinet and sign components shall operate in the following temperature and humidity conditions:
			1. Operational & storage temperature range: -40°F to +165°F
			2. Humidity range: 0% to 99% (non-condensing)
	2. Discrete LEDs
		1. All LEDs shall have a nominal viewing cone of 30° with a half-power angle of 15° measured from the longitudinal axis of the LED. Viewing cone tolerances shall be as specified in the LED manufacture’s product specifications and shall not exceed ± 3 degrees.
		2. The discrete LEDs shall be driven at a current level that is in accordance with their operating environment. Signs will use voltage pulse width modulation (PWM) to achieve the proper LED intensity level for ambient light conditions. The drive pulse shall be modulated at a frequency high enough to provide flicker-free operation.
		3. The LED drive circuit board shall contain a microcontroller regulation circuit that controls the PWM duty cycle.
	3. LED Specifications

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| LED Type | Color (nm) | Min Brightness (mcd) | Viewing Angle |
| Red | 625 | 3,000 | 120° |
| Red | 625 | 2,200 | 30° |
| Orange | 605 | 6,000 | 30° |
| Amber | 590 | 2,600 | 120° |
| Amber | 590 | 5,000 | 30° |
| Green | 525 | 3,000 | 120° |
| Green | 525 | 9,000 | 30° |
| Blue | 470 | 700 | 120° |
| White | x= 0.31 y= 0.32 | 5,500 | 120° |
| White | x= 0.31 y= 0.32 | 27,000 | 30° |

* 1. Regulated DC Power Supplies
		1. The LED Circuit board shall be powered with auto-ranging regulated switching power supply that converts the incoming AC electricity to DC, at a nominal voltage of 12VDC.
		2. Power supplied shall be UL recognized.
		3. Power supplies shall be arranged in a redundant parallel configuration, and rated such that if one supply fails the remaining supply shall be able to operate 100% of the LEDs in the sign message.
		4. The pair of power supplies shall contain two physically and electrically independent supplies. The pair of power supplies shall be placed in parallel according to the manufacturer’s recommendations.
		5. Power supplies used to power the LED sign message and its controller board shall be identical and interchangeable.
	2. Power Supply Specifications:
		1. Nominal output voltage: 12 VDC ±10%.
		2. Operating temperature range for 100% output power: -40°F to +140°F
		3. Operating input voltage range: 85 VAC to 264 VAC.
		4. Typical power supply efficiency: 81%
		5. Minimum power factor rating: 0.93.
		6. The power supply shall not be taxed beyond 65% of its rated maximum rated output.
		7. Power supply input circuit shall be fused.
		8. Automatic output shutdown and restart if the power supply experiences any of the following output faults: over-voltage, short circuit, or over-current.
1. Wiring and Power Distribution
	1. Internal Wiring
		1. Wiring for the sign components shall be installed in a neat and professional manner. Wiring shall not impede the removal of power supplies or other sign components.
		2. Wires shall not make contact with, nor bend around sharp metal edges. All wiring shall conform to the National Electrical Code
		3. All internal wiring shall use drip loops.
	2. Earth Grounding
		1. Cabinet shall have one earth ground lug that is electrically bonded to the sign cabinet. All earth grounding shall conform to the National Electrical Code.
	3. UL/cUL Listed for wet locations
2. Environmental Monitoring System
	1. Ambient Light Measurement
		1. Sensors that measure the outdoor ambient light level at the site shall be mounted directly to the LED circuit board.
		2. Three photocell sensors shall be placed such that they measure the ambient light striking the front face. The sign controller shall continuously monitor the light sensors and adjust the LED light intensity to a level that creates a legible message on the face.
		3. Photocell sensors shall operate in a redundant manner such that if one sensor fails, the remaining light sensors shall continue to adjust the LED light intensity to create a legible message on the face.
		4. The LED automatic dimming functionality shall continue normally with only a single functioning sensor remaining.