

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	Angle of illumination specified as a maximum. Maximum limit of dominant wavelength changed. Added LED diffusion test. Changed dominant wavelength test equipment requirements. Added CAGE 50434.	14 October 1988	Jack Niles
B	Added CAGE 07479. Editorial changes throughout.	14 March 1992	G. A. Lude
C	Added CAGE 10236. Editorial changes throughout.	29 January 1996	M. Stucker
D	Reformat drawing and update supplier base.	30 April 2003	Thomas M. Hess
E	Add lead frame termination options, insulation resistance, new part numbers (termination types and finish), revised test requirements, supplier address change. Editorial changes throughout. RK	13 October 2009	Thomas M. Hess
F	Delete certain photometer requirements, correct figure 1, regroup table III tests, added PVC insulation prohibition, add new supplier information, editorial corrections throughout. DJC	23 March 2012	Thomas M. Hess
G	Add supplier part numbers, replace first article inspection, editorial changes throughout. DJC	19 December 2014	Thomas M. Hess

CURRENT DESIGN ACTIVITY CAGE CODE 037Z3
DEFENSE LOGISTICS AGENCY
DLA LAND AND MARITIME, OHIO 43218-3990

Prepared in accordance with ASME Y14.100

REV																											
PAGE																											
REV STATUS OF PAGES	REV	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G										
	PAGE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15											
PMIC N/A		PREPARED BY Jack D. Niles						DESIGN ACTIVITY DEFENSE ELECTRONICS SUPPLY CENTER, DAYTON, OH 45444-5000																			
Original date of drawing 30 July 1987		CHECKED BY Jack D. Niles						TITLE INDICATOR ASSEMBLIES, IR SECURE LIGHTING; RED, YELLOW, GREEN; PANEL SEALING																			
		APPROVED BY John H. Buchanan																									
		SIZE A	CAGE CODE 14933				DWG. NO. 87019																				
			REV	G	PAGE 1 OF 15																						

1. SCOPE

1.1 Scope. This drawing describes the requirements for IR secure indicator assemblies with panel sealing and panel and rear sealing with filtered type lens designed for sunlight viewing. The indicator assemblies also have an antireflection coated lens and are available with an optional electrostatic screen.

1.2 Part or Identifying Number (PIN). The complete PIN shall be as follows:

87019	-@	##	\$	&
Drawing number	Color (see 1.2.1)	Device type (see 1.2.2)	Lead termination type (see 1.2.3)	Lead finish (see 1.2.4)

The dash number shall consist of the color and device type designators.

1.2.1 Color designators. The color designator shall be a single character as follows:

<u>Color designator</u>	<u>Color</u>	<u>(Dominant wavelength, typical)</u>
R	Red	(626 nm)
Y	Yellow	(585 nm)
G	Green	(571 nm)

1.2.2 Device types. The device types shall identify the body style as follows:

<u>Device type</u>	<u>Description</u>
01	Long body; flat glass IR blocking lens with restricted viewing angle for securing lighting and sunlight viewing; anti-reflection coating; 30 degrees full cone angle maximum of illumination; rear terminations sealed. <u>1/</u>
02	Same as device type 01 but with electrostatic screen. <u>1/</u>

1.2.3 Lead termination type. Two types of lead termination are available for indicator assemblies, pin terminals (see [figure 1](#)) or solder loops (see [figure 2](#)). Indicator assemblies with pin terminals shall include a designator "1" in the PIN. Indicator assemblies with solder loops shall include a designator "2" in the PIN (see 1.2).

1.2.4 Lead finish. Two types of lead finish are available for indicator assemblies, tin-lead solder or silver plate. Indicator assemblies with tin-lead solder on its terminals shall include a suffix "A" in the PIN. Indicator assemblies with silver plated terminals shall include a suffix "B" in the PIN (see 1.2).

1/ The off-axis angle where the luminous intensity is one half the on-axis intensity shall be 15 degrees maximum and 10 degrees minimum.

1.3 Absolute maximum ratings.

	Red	Yellow	Green
Peak forward current	90 mA dc	60 mA dc	90 mA dc
Maximum forward current	30 mA dc	20 mA dc	30 mA dc
Maximum reverse voltage	5 V	5 V	5 V
Maximum power dissipation	135 mW (1)	85 mW (2)	135 mW (1)
Operating and storage temperature	-55°C to +100°C		
Power emission (350 through 930 nm) at $I_F = 10$ mA dc	1 μ W		

- (1) Derate at 1.8 mW/°C above +25°C ambient temperature.
(2) Derate at 1.6 mW/°C above +50°C ambient temperature.

1.4 Primary photometric (visual) characteristics.

	Red	Yellow	Green
Peak wavelength (typical)	635 nm	583 nm	565 nm
Dominant wavelength (typical)	626 nm	585 nm	571 nm
Luminous intensity at $I_F = 10$ mA dc	2.5 mcd	4.0 mcd	5.0 mcd

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this document. This section does not include documents cited in other sections of this document or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this document, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-C-675	—	Coating of Glass Optical Elements (Anti-reflection).
MIL-DTL-3661	—	Lampholders, Indicator Lights, Indicator Light Housings, and Indicator Light Lenses, General Specification for.
MIL-DTL-5541	—	Chemical Conversion Coatings on Aluminum and Aluminum Alloys.
MIL-A-8625	—	Anodic Coatings for Aluminum and Aluminum Alloys.
MIL-PRF-13830	—	Optical Components for Fire Control Instruments; General Specification Governing the Manufacture, Assembly, and Inspection of.
MIL-PRF-19500	—	Semiconductor Devices, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130	—	Identification Marking of U.S. Military Property.
MIL-STD-202	—	Test Method Standard, Electronic And Electrical Component Parts.
MIL-STD-750	—	Test Methods for Semiconductor Devices.

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OH 45444-5000	SIZE	CODE IDENT NO.	DWG NO.
	A	14933 REV F	87019 PAGE 3

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-454 – General Guidelines for Electronic Equipment.

(Copies of these documents are available online at <http://quicksearch.dla.mil>.)

2.3 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

IES – ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA

IES RP-16 – Nomenclature and Definitions for Illuminating Engineering.

(Application for copies should be addressed to the Illuminating Engineering Society of North America, 120 Wall Street, 17th Floor, New York, NY 10005 or online at <http://www.iesna.org>.)

(Non-Government standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Item requirements. All indicator assemblies specified herein shall meet all requirements of **MIL-PRF-19500** as specified herein except qualification requirements. Dimensions are in millimeters; inch equivalents are in parentheses.

3.2 Manufacturer eligibility. To be eligible for listing as an approved source of supply, a manufacturer shall be either listed on the **MIL-PRF-19500** Qualified Manufacturers List for at least one device type or perform the screening and group E inspections specified herein on a sample of parts agreed upon by the manufacturer and DLA Land and Maritime-VA. The manufacturer shall make available to DLA Land and Maritime, upon request, all pertinent test data on its production of the listed parts, including, but not limited to, test data in accordance with **tables I, II, and III**.

3.2.1 Certificate of compliance. A certificate of compliance shall be required from manufacturers for listing as an approved source of supply in 6.6 herein. The certificate of compliance submitted to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, prior to listing as a source of supply in 6.6, shall state that the manufacturer's product meets all the requirements as specified herein. It is prohibited for a manufacturer not listed in 6.6 to supply or mark indicator assemblies with this drawing number.

3.2.2 Certificate of conformance. A certificate of conformance shall be provided with each lot of indicator assemblies delivered in accordance with this drawing.

3.3 Abbreviations, definitions, and symbols. The abbreviations, acronyms, definitions, and symbols used herein shall be as specified in **IES RP-16**, **MIL-PRF-19500**, and **MIL-DTL-3661** and herein.

I_F	Forward current.
I_P	Peak operating forward pulse current.
I_V	Luminous intensity (the subscript V is used to designate a photometric or visual quantity to differentiate from I as used herein for current).
mcd	Milli-candela; the candela is a unit of luminous intensity defined such that the luminance of a blackbody radiator at the temperature of solidification of platinum is 60 candelas per square centimeter.
T_A	Ambient temperature.
Θ	The angle at or off the axis of symmetry of a light source at which luminous intensity is measured.

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OH 45444-5000	SIZE	CODE IDENT NO.	DWG NO.
	A	14933 REV F	87019 PAGE 4

3.4 Interface and physical dimensions. The interface and physical dimensions of the indicator assemblies shall be as specified on [figures 1, 2 and 3](#) herein. Each indicator assembly shall consist of a metal body (housing), an integral light emitting diode with a diffusant, diffusing surface, or a uniform diffuser film placed in front of the LED, a glass lens that is sealed to the body with a metal lens cap, an infrared suppressing filter, a sealing capability between the body and mounting panel, and with solid termination leads.

3.5 Parts, processes, materials, and finishes. Unless otherwise specified, the parts, materials, processes, and finishes shall conform to guideline 5 of [MIL-HDBK-454](#), [MIL-DTL-3661](#), and herein.

3.5.1 Materials and parts.

3.5.1.1 Antireflection coating. The coating on the operator side of the filter shall be an antireflection coating in accordance with [MIL-C-675](#).

3.5.1.2 Body and nut. The body and nut materials shall be aluminum alloy.

3.5.1.3 LED source. The LED shall be an integral part of the indicator assembly and is not replaceable.

3.5.1.4 Filter lens. The filter lens shall be a neutral color transmission filter without converging or diverging power.

3.5.1.5 Sealing ring. The sealing ring shall be polytetrafluoroethylene (PTFE).

3.5.1.6 Shroud and contrast ring. The shroud and contrast ring shall be aluminum alloy.

3.5.1.7 Terminations. The lead terminations shall be copper alloy, mild steel, Kovar or Alloy 42.

3.5.1.8 Washer. The washer shall be copper alloy.

3.5.1.9 Prohibited materials.

3.5.1.9.1 Pure tin. The use of pure tin, as an underplate or final finish, is prohibited both internally and externally. Tin content of components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see [6.4](#)).

3.5.1.9.2 PVC. The use of wire with PVC insulation is prohibited.

3.5.2 Processes.

3.5.2.1 Filter lens. All components of the filter lens shall be optically bonded.

3.5.2.2 LED leads. The LED leads shall be attached to terminations using a welding or high temperature solder process.

3.5.2.3 Shroud and contrast ring. When shroud is not integral to the body, a locking compound shall be used to secure shroud to body.

3.5.3 Finish.

3.5.3.1 Body and nut. The body and nut finish shall be treated to a conversion coating in accordance with [MIL-DTL-5541](#), class 3.

3.5.3.2 Lead terminations. The termination finish shall be silver plate or tin-lead solder (see [6.4](#)).

3.5.3.3 Shroud and contrast ring. The shroud and contrast ring finish shall be black anodized (matte) in accordance with [MIL-A-8625](#).

3.5.3.4 Washer. The washer finish shall be tin or nickel plate.

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OH 45444-5000	SIZE	CODE IDENT NO.	DWG NO.
	A	14933	87019
		REV F	PAGE 5

3.6 Performance.

3.6.1 Antireflection coating. The coating on the operator side of the filter shall be an antireflection coating in accordance with [MIL-C-675](#) with the exception that the spectral reflectance shall be as follows:

Wavelength range Nanometers	Reflectance (percent maximum) for angle of incidence shown	
	0 degrees	30 degrees
440 to 685	0.6 absolute	1.0 absolute
	0.4 average	0.5 average

3.6.2 Electrostatic protection. When specified (see [1.2](#) and [1.2.2](#)), a transparent conductive film coating or conductive mesh shall be provided between the lens and LED. This coating or mesh shall act as an EMI shield, providing a maximum resistance of 7 ohms/square.

3.6.3 Filter luminous transmission. The filter shall have a luminous transmission 40 percent maximum in the spectral region 400 through 700 nanometers as measured with an eye corrected photometer or otherwise.

3.6.4 Filter power transmission. The filter shall have a power transmission of 0.5 percent maximum in the spectral region 700 through 930 nanometers for red, yellow, and green as measured with the spectrograph of [4.4.3](#) or equivalent. The actual 0.5 percent maximum transmission through 930 nanometers may begin between 600 nanometers and 700 nanometers.

3.6.5 Filter surface quality. The filter shall meet or exceed the scratch-dig quality requirements of [MIL-PRF-13830](#), level 60-40.

3.6.6 Filter transmission uniformity. The spectral transmission of the filter between 350 and 930 nanometers shall remain uniform throughout the entire clear aperture of the filter as measured with the spectrograph of [4.4.3](#) or its average value throughout the filter. Permissible range of measuring spot size shall be greater than 0.127 mm (0.005 inch) and less than 1.651 mm (0.065 inch) in diameter. If the indicator assembly includes an electrostatic mesh screen as on [figure 1](#), either the measuring spot shall be smaller than the screen openings (and the measurements shall be made only within the open areas), or it shall be large enough to include several such openings so that the opaque regions of regularly spaced mesh have no net effect on uniformity measurements.

3.6.7 LED diffusing. Light emitted by the indicator assembly must be uniformly diffused. The light emitting area of the indicator assembly shall be measured with a photometer utilizing a measuring spot size meeting the requirements of [3.6.6](#). Four regions of the light emitting area shall be measured perpendicular to the front plane of the indicator assembly. The four regions shall be with one centered on-axis and the other three regions centered off-axis at one half the radius of the light emitting area, with their centers 120 degrees in angular rotation apart. The luminous intensity of the three off-axis regions shall vary no more than 50 percent of the luminous intensity of the on-axis region.

3.6.8 Solderability. The lead terminations shall be solderable in accordance with method 2026 of [MIL-STD-750](#).

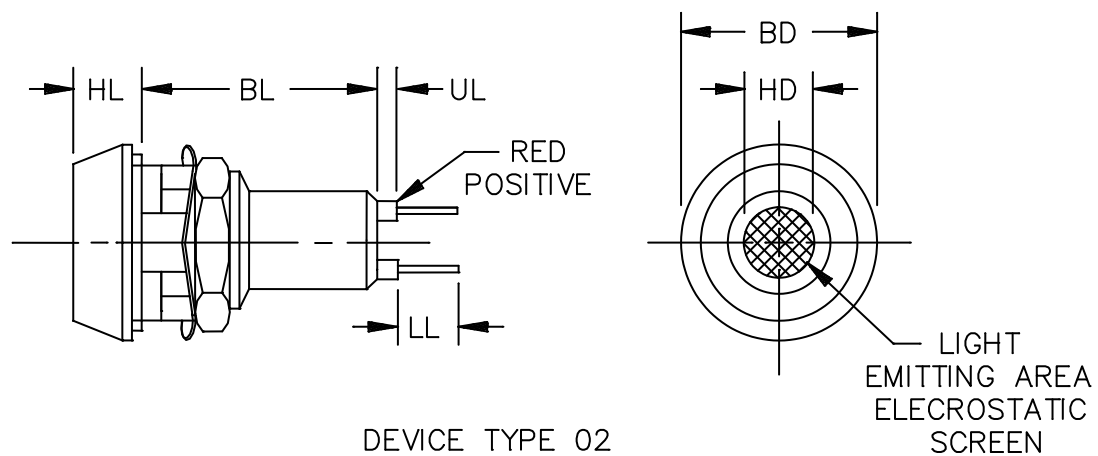
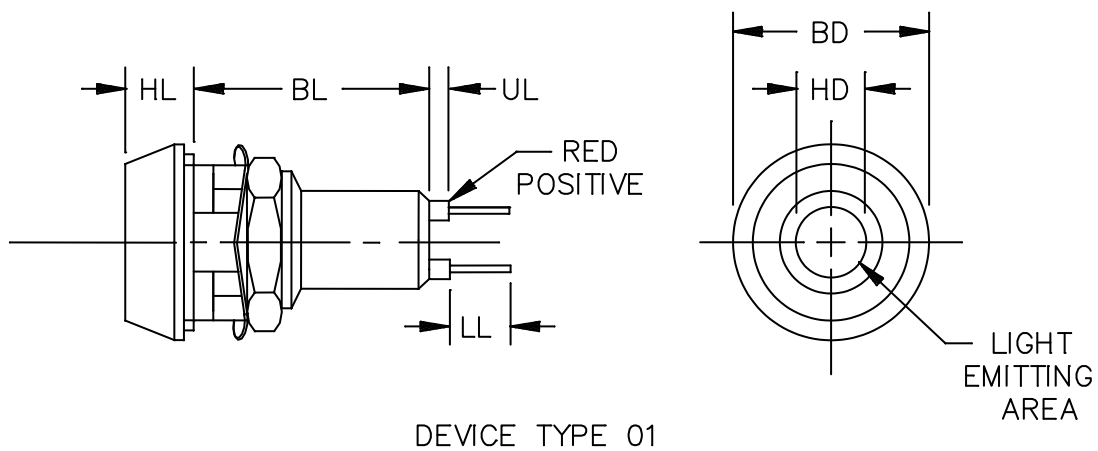
3.7 Mounting information. [Figure 3](#) shows the recommended mounting hole details. The recommended mounting torque shall be no greater than 1 Nm (8.85 pound inch). The preferred chassis thickness is 3 mm (.118 inch). Chassis sealing surface to be clean and burr free.

3.8 Marking. Marking shall be in accordance with [MIL-STD-130](#). The manufacturer shall mark the indicator assembly with CAGE code, date code and DESC PIN. The order of marking is optional.

3.9 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, or environmentally preferable, or biobased materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.10 Workmanship. The indicator assemblies shall be uniform in quality and free from any defects that will affect life, serviceability or appearance.

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OH 45444-5000	SIZE	CODE IDENT NO.	DWG NO.
	A	14933 REV F	87019 PAGE 6



LTR	Millimeters		Inches	
	min	max	min	max
BD		13.10		.516
BL	19.00	20.02	.748	.788
HD	5.09	5.11	.197	.205
HL		5.51		.217
LL	8.00	11.00	.315	.433
UL	0.99	2.01	.039	.079

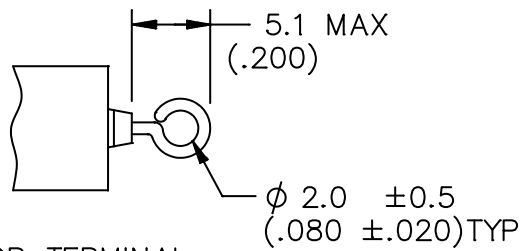
FIGURE 1. Design and dimensions (lead termination type 1 pin terminals shown).

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OH 45444-5000

SIZE
A

CODE IDENT NO.
14933
REV **F**

DWG NO.
87019
PAGE **7**



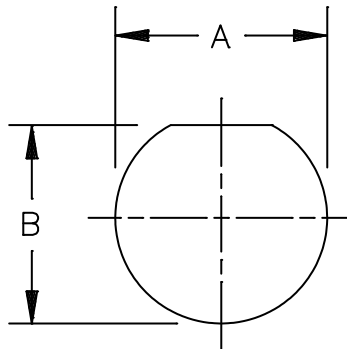
LOOP TERMINAL

DIMENSIONS FOR SOLDER LOOP TERMINATION LEAD OPTION TYPE 2

NOTES:

1. Dimensions are in millimeters. Inch equivalents are given for general information only.
2. Unless otherwise specified, tolerance is ± 0.51 mm (.02 inch) for no place decimals and ± 0.25 mm (.010 inch) for one place decimals.

FIGURE 2. Terminations solder loop design.



Ltr	Dimensions			
	Millimeters		Inches	
	min	max	min	max
A	8.0	8.1	.315	.319
B	7.5	7.6	.295	.299

FIGURE 3. Mounting hole details.

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OH 45444-5000

SIZE

A

CODE IDENT NO.

14933

REV F

DWG NO.

87019

PAGE 8

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Screening (see 4.2, tables I and II herein).
- b. Group E inspection (see 4.3 and table III herein).

4.2 Screening. All indicator assemblies shall be 100 percent screened in accordance with table I herein. Indicator assemblies that exceed the limits of table II herein shall be rejected.

TABLE I. Screening tests.

Test	MIL-STD-750	
	Method	Conditions and measurements
Visual and mechanical inspection	2071	See 4.4.1
High temperature storage (non-operating)	1032	T _A = +100°C, minimum, time = 72 hours minimum
Thermal shock (temperature cycling)	1051	Test condition A, except T _(high) = +100°C, 10 cycles; time at temperature extremes = 15 minutes minimum
Constant acceleration	2006	Non-operating 20,000 g; Y ₁ only
Seal	1011	Test condition A
	4011	V _F
	4016	I _R
Burn-in (forward bias)		I _F = 20 mA dc for yellow; 30 mA dc, for red and green; constant current shall be maintained; T _A = +25°C ±5°C for 168 hours minimum
Post burn-in measurements		I _V , in accordance with table II (within 72 hours of burn-in)
	4011	V _F
	4016	I _R
Insulation resistance	1/	R _{ISO} = 1000 MΩ minimum

1/ Test method 302 of MIL-STD-202, condition B, apply 500 V dc between both terminations (leads) and body.

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OH 45444-5000

SIZE
A

CODE IDENT NO.
14933
REV **F**

DWG NO.
87019
PAGE **9**

TABLE II. Electrical and spectral characteristics.

Test	Dash number	MIL-STD-750		Symbol	Limits		Unit
		Method	Condition		Min	Max	
LED diffusion (see 3.6.7)	X01, X02 <u>1/</u>		$I_F = 10 \text{ mA}$	I_D	50	150	Percent of on-axis luminous intensity
Luminous intensity (see 4.4.2 measured on-axis)	R01, R02		$I_F = 10 \text{ mA}$	I_V	0.5	2.5	mcd
	Y01, Y02		$I_F = 10 \text{ mA}$	I_V	0.5	4.0	mcd
	G01, G02		$I_F = 10 \text{ mA}$	I_V	0.5	5.0	mcd
Total power emission (350 through 930 nm) (see 4.4.4)	X01, X02 <u>1/</u>		$I_F = 10 \text{ mA}$	P_E		1	μW
Power emission (see 4.4.5)	R01, R02		$I_F = 10 \text{ mA}$ 700 through 930 nm	P_{IRR}		0.5	percent of total
	Y01, Y02		$I_F = 10 \text{ mA}$ 675 through 930 nm	P_{IRY}		0.5	percent of total
	G01, G02		$I_F = 10 \text{ mA}$ 620 through 930 nm	P_{IRG}		0.5	percent of total
Dominant wavelength (see 4.4.6) <u>2/</u>	R01, R02		$I_F = 10 \text{ mA}$	λ_d	615	635	nm
	Y01, Y02		$I_F = 10 \text{ mA}$	λ_d	580	590	nm
	G01, G02		$I_F = 10 \text{ mA}$	λ_d	555	572	nm
Forward voltage	X01, X02 <u>1/</u>	4011	$I_F = 20 \text{ mA}$	V_F	1.6	3.0	V
Reverse current	X01, X02 <u>1/</u>	4016	$V_R = 5 \text{ V}$	I_R		100	μA
Insulation resistance	X01, X02 <u>1/</u>	<u>3/</u>		R_{ISO}	1,000		$M\Omega$

1/ The character "X" in the dash number represents either R, Y, or G.

2/ Referred to CIE illuminant "C" (.3101, .3163).

3/ Test method 302 of MIL-STD-202, condition B, apply 500 V dc between both terminations (leads) and body.

4.3 Group E inspection. Group E inspection shall be performed on test specimens that are representative of subsequent production. Test specimens shall be inspected as specified in table III.

4.3.1 Inspection routines. Group E inspection shall consist of either a full inspection or partial inspection as specified.

4.3.1.1 Full inspection: One test specimen shall be submitted for group E inspection and subjected to the testing of each subgroup of table III in the order shown. Alternately, separate test specimens of the same PIN may be tested for each subgroup. All product characteristics (i.e., indicator assembly color, lead termination, and lead finish) of the PINs to be listed for a manufacturer shall be covered in the full group E inspection.

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OH 45444-5000

SIZE
A

CODE IDENT NO.
14933
REV **F**

DWG NO.
87019
PAGE **10**

4.3.1.2 Partial inspection: One test specimen or alternately, separate test specimens of the same PIN may be tested as specified below:

- a. If a given indicator assembly color was not included in the initial group E inspection, a partial group E inspection, as a minimum, shall be conducted consisting of subgroups 2, 3, and 4 of [table III](#) herein.
- b. If a given lead termination type was not included in the initial group E inspection, a partial group E inspection, as a minimum, shall be conducted consisting of subgroup 5 of [table III](#) herein.
- c. If a given lead finish was not included in the original group E inspection, a partial group E inspection, as a minimum, shall be conducted consisting of the solderability test on that lead finish.

4.3.2 Extent of listing. A group E inspection on a particular indicator assembly PIN shall be extended to cover other indicator assemblies PINs within the following range of characteristics as follows:

- a. A group E inspection for a PIN with an electrostatic screen shall cover a PIN without an electrostatic screen, and vice versa.
- b. A group E inspection for a PIN with a short body shall cover a PIN with a long body, and vice versa.
- c. A group E inspection for a PIN with a 30 degree solid angle shall cover a PIN with a 100 degree solid angle, and vice versa.
- d. A group E inspection for a PIN with a flat glass filter lens shall cover a PIN with a plano-convex plain glass lens, and vice versa.
- e. A group E inspection for a PIN with antireflection coating shall cover a PIN not having the antireflection coating, and vice versa.

4.3.3 Design, location, material, or process changes. A full or partial group E inspection may be required when any of the following events occurs:

- a. A change in the design affecting form, fit, or function of the part.
- b. A change in the location of the manufacture.
- c. A change in manufacturing source(s), process(es), inspection method(s), tooling or materials, affecting form, fit, or function.
- d. A natural or man-made event, which may adversely affect the manufacturing process.
- e. A lapse of production for two years or more, or as specified by the customer.

4.3.4 Nonconformances. The group E inspection is not complete until all non-conformances are closed affecting the part and corrective actions have been implemented. The group E inspection shall be repeated for the affected characteristics and the results recorded.

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OH 45444-5000	SIZE	CODE IDENT NO.	DWG NO.
	A	14933 REV F	87019 PAGE 11

TABLE III. Group E inspection.

Inspection	MIL-STD-750	
	Method	Conditions
<u>Subgroup 1</u>		
Solderability	2026	
Resistance to solvents	1022	
<u>Subgroup 2</u>		
Thermal shock	1051	Test condition A, T _(high) = +100°C 10 cycles; time at temperature extremes = 15 minutes minimum
Immersion (seal)	1011	Test condition A
Water tightness (panel sealing)		See MIL-DTL-3661, sealing test water tight except maximum pressure 30 psi
Electrical and spectral measurements		See table II
<u>Subgroup 3</u>		
Life test	1027	
Electrical and spectral measurements		See table II
<u>Subgroup 4</u>		
High temperature life (non-operating)	1032	T _A = +100°C, time = 72 hours minimum
Electrical and spectral measurements		See table II
<u>Subgroup 5</u>		
Terminal strength	2036	Test condition A, 2 pounds for 10 seconds
Vibration	2056	
Shock	<u>1/</u>	Three (3) shocks shall be applied in each of the three mutually perpendicular axes of the test specimen for 18 shocks total
Electrical and spectral measurements		See table II

1/ Test method 213 of MIL-STD-202, test condition A (50 g max for 11 ms).

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OH 45444-5000

SIZE
A

CODE IDENT NO.
14933
REV **F**

DWG NO.
87019
PAGE **12**

4.4 Methods of inspection. Methods of inspection shall be as specified herein.

4.4.1 Visual and mechanical inspection. Indicator assemblies shall be examined under a magnification between 3X and 10X. Indicator assemblies that exhibit any of the following defects shall be rejected.

- a. Termination identification, markings (content, placement, and legibility), materials, construction, and workmanship not in accordance with the requirements specified herein.
- b. Defects or damage resulting from manufacturing, handling, or testing.
- c. Visible evidence of corrosion, contamination, or breakage, grossly bent or broken terminations, cracked seals, and peeled, flaked, or blistered plating. (Discoloration of the finish shall not be cause for failure unless there is evidence of flaking, pitting or corrosion.)
- d. Terminations that are not intact and aligned in their normal location, free of sharp or unspecified termination bends.
- e. Terminations and lens that are not free of foreign material such as paint, or other adherent deposits, or dust.

4.4.2 Axial luminous intensity. This measurement is made with a calibrated and traceable to the National Institute of Standards and Technology (NIST) photometer or spectroradiometer.

4.4.3 Power measurements. Power measurements shall utilize a spectrograph having the following detector or equivalent:

- a. A generation II microchannel plate (MCP) proximity focused type,
- b. Intensified self-scanning, high quantum efficiency, multi-element, silicon photodiode array with an S-20 extended red response. This detector must have the following characteristics:
 1. Minimum dynamic range of detector A to D converter: 16,383 counts/photo electron.
 2. Detector saturation level: 40 $\pm$ 10 picowatt seconds per square centimeter.
 3. Detector dark current noise: 2 $\pm$ 2 counts rms out of 16,000 $\pm$ 400 for a 10-millisecond exposure time.

4.4.3.1 Stray light test for self scanning spectrograph assembly. The system shall sample the spectra between 350 nanometers and 930 nanometers utilizing appropriate averaging times to increase system dynamic range. When measuring an incandescent light source that is filtered with a WAMCO, Incorporated NV-2YL-1 yellow filter (no substitute filter may be used), and set to a level of 100 foot lamberts, the energy measured at 800 nanometers shall be no more than .01 percent of the energy measured at 470 nanometers. Each NV-2YL-1 filter procured by the vendor must be accompanied by the transmission data for each particular filter at 5 nanometers intervals from 400 nanometers to 930 nanometers.

4.4.3.2 Calibration method. Equipment must have all measurement functions calibrated and traceable to NIST within a 3-month period prior to their use for any measurements. This equipment shall be calibrated annually thereafter for all measurement functions utilized and be traceable to NIST. Calibrate the system for wavelength with a low pressure potassium (K) spectral line lamp and for power with standard of spectral radiance.

4.4.4 Total power measurement. This measurement shall utilize the spectrograph in 4.4.3 and an integrating sphere and the conditions of [table II](#) to determine the total power emission.

4.4.5 Power emission. This measurement shall utilize the spectrograph in 4.4.3 and the conditions defined in [table II](#). The limits for each color shall meet the specified percentage of the total power measured in this test.

4.4.6 Dominant wavelength. This measurement shall utilize a photometer with the calibrated tristimulus filter set or a spectroradiometer, and the conditions defined in [table II](#), to determine the dominant wavelength.

4.4.7 Insulation resistance. This measurement shall be in accordance with test method 302 of [MIL-STD-202](#), condition B. A voltage of 500 V dc shall be applied between both terminations and body.

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OH 45444-5000	SIZE	CODE IDENT NO.	DWG NO.
	A	14933	87019
		REV F	PAGE 13

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Indicator assemblies conforming to this drawing are intended for use when performance specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. This drawing is intended exclusively to prevent the proliferation of unnecessary duplication of specifications, drawings, and stock catalog listings. When a performance specification exists and the product covered by this drawing has been qualified for listing on the QPL, this drawing becomes obsolete and will not be used for new design. The QPL product shall be the preferred item for all applications.

6.2 Acquisition requirements. Acquisition documents should specify the following when required:

- a. Title, number, and date of this drawing.
- b. The complete PIN (see 1.2).
- c. First article inspection (see 3.2).
- d. Requirements for delivery of one copy of the conformance inspection data or certificate of compliance that parts have passed conformance inspection with each shipment of parts by the manufacturer.
- e. Packaging requirements (see 5.1).

6.3 Users of record. Coordination of this document for future revisions are coordinated only with the approved sources of supply and the users of record of this document. Requests to be added as a recorded user of this drawing may be achieved by electronic mail at semiconductor@dla.mil or by facsimile (614) 693-1642 or DSN 850-6939 or in writing to: DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990.

6.4 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to ASTM-B545 (Standard Specification for Electrodeposited Coatings of Tin).

6.5 Replaceability. Indicator assemblies covered by this drawing will replace the same commercial device covered by contractor-prepared specification or drawing.

DESC drawing PIN 87019 (1)	Color	CAGE	Similar PIN
-R01	Red	3R006	STR/LH/8/XIRR
-Y01	Yellow		STR/LH/8/XIRY
-G01	Green		STR/LH/8/XIRG
-R02	Red		STR/LH/8/XIR/SESR
-Y02	Yellow		STR/LH/8/XIR/SESY
-G02	Green		STR/LH/8/XIR/SESG

- (1) Parts must be purchased to this DESC PIN to assure that all performance requirements and tests are met.

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OH 45444-5000	SIZE	CODE IDENT NO.	DWG NO.
	A	14933 REV F	87019 PAGE 14

6.6 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed with this drawing and have submitted a certificate of compliance (see 3.2.1 herein) to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990.

DESC drawing PIN 87019 (1)	Color	Vendor similar designation or type number (2) (3)	Vendor contact data CAGE 10236
-R01\$& -Y01\$& -G01\$& -R02\$& -Y02\$& -G02\$&	Red Yellow Green Red Yellow Green	ML1619-R021X ML1619-Y021X ML1619-G021X ML1619-R121X ML1619-Y121X ML1619-G121X	L-3 Electrodynamics, Inc. 1200 Hicks Road Rolling Meadows, IL 60008 TEL: (847) 660-1750 FAX: (847) 660-1751 URL: www2.l-3com.com/edi Electronic mail: edi.info@l-3com.com 

- (1) The character "\$" in the PIN indicates the style of lead termination: "1" shall be used for pin terminals, "2" shall be used for solder loops. The character "&" in the PIN indicates lead finish: "A" shall be used for tin-lead solder finish, "B" shall be used for silver plate.
- (2) **CAUTION:** Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
- (3) Part number suffix represented by letter "X" indicates lead termination: "1" shall be used for pin terminals, "2" shall be for solder loops.

DESC drawing PIN 87019 (1)	Color	Vendor similar designation or type number (2) (3)	Vendor contact data CAGE 3R006
-R011& -Y011& -G011& -R021& -Y021& -G021&	Red Yellow Green Red Yellow Green	OX2410R\$ OX2410Y\$ OX2410G\$ OX2411R\$ OX2411Y\$ OX2411G\$	Oxley, Inc. 31 Business Park Drive Branford, CT 06405 TEL: (203) 488-1033 FAX: (203) 481-6971 TEL: (203) 488-1033 FAX: (203) 481-6971 URL: http://www.oxleygroup.com/usa Electronic mail: info@oxleygroup.com 

- (1) The character "&" in the PIN indicates lead finish: "A" shall be used for tin-lead solder finish, "B" shall be used for silver plate.
- (2) **CAUTION:** Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
- (3) Parts only available in pin terminal style. Last character (\$) in vendor part number indicates lead finish. A blank space or "A" designates tin-lead solder finish, a "B" designates silver plate.

DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OH 45444-5000	SIZE A	CODE IDENT NO. 14933	DWG NO. 87019
		REV F	PAGE 15