

APPROACH LIGHTING

ALSF/MALSR

Low-Voltage ALSF/MALSR Approach Lighting System

WITH ELEVATED & IN-PAVEMENT FLASHERS



Compliance with Standards

- FAA:** Designed according to ALSF-1, ALSF-2, ALSF-2/SSALR: FAA-E-2628; MALSR: FAA-E-2325
- ICAO:** Annex 14 Vol. 1, para. 5.3.4, 5.3.4.17, 5.3.7, and 5.3.8
- Military:** UFC 3-535-01 – Chapter 3 for Approach Applications using sequenced flashing lights

ALSF Uses

ALSF-1, ALSF-2, and ALSF-2/SSALR approach lighting systems with sequenced flashing lights are used at airports and military air bases to provide landing approach guidance, such as runway alignment, height perception, horizontal reference, and roll guidance extending from the landing threshold outward (2,400-3,000 feet) into the approach zone. Note that FAA-E-2628 specifies only the sequenced flasher portion of the ALSF approach lighting system. The steady-burning portion of an ALSF system is implemented using either a 6.6 A or 20 A series circuit.

ALSF-1

- The ALSF-1 approach lighting system is used on Category I Instrument Landing Systems (ILS) and includes up to 24 light stations (100-foot spacing) with up to 22 centerline bars of steady-burning lights (five lights to a bar) and up to 15 flashers.

ALSF-2

- The ALSF-2 approach lighting system is used on Category II runways and includes up to 30 light stations (100-foot spacing) with 30 centerline bars of steady-burning lights (five lights to a bar) and up to 21 flashers.

ALSF-2/SSALR

- The SSALR approach lighting system has up to eight sequenced flashing lights and is used as part of a dual-mode approach lighting system (ALSF-2/SSALR) when Category I conditions exist on Category II designated runways.

Note: For ICAO applications, the system can also be used with up to 30 flashers.

MALSR Uses

The MALSR approach lighting system with sequenced flashing lights are used at airports and military air bases to provide landing approach guidance, such as runway alignment, height perception, horizontal reference, and roll guidance extending from the landing threshold outward (2,400-3,000 feet) into the approach zone. Note

that FAA-E-2325 specifies both the sequenced flasher and steady-burning portions of a MALSR approach lighting system.

Operating Conditions

- Temperature Range: -67 °F to +137 °F (-55 °C to +55 °C)
Humidity: 0 to 100%
Altitude: 0 to 10,000 ft (3048 m) maximum

Features

- MALSR sequenced flashers can be easily expanded to ALSF at a later date
- Flasher operating voltage is +400 VDC instead of +2000 VDC used in traditional systems, improving safety.
- 600 V cable can be used between the flasher and Individual Control Cabinet (ICC), eliminating the need for high voltage interconnecting cable.
- Lamp sub-assembly in elevated flash head can be quickly and easily replaced without the use of tools
- In-pavement flasher has an aluminum top cover, reducing maintenance requirements and resulting in a very low weight
- In-pavement flasher height above ground (without snow plow ring) is only 0.75" high. In-pavement flasher height above ground (with snow plow ring) is only 0.5" high.
- Flashers can be up to 393 ft (120 m) from the ICC, allowing placement outside the obstacle free zone
- ICC can be optionally supplied with one cabinet that can connect to 3 flashers, minimizing acquisition and installation cost
- ICC uses a highly efficient power supply. This yields lower power consumption, elimination of peak inrush currents, and allows use of smaller gauge supply power wires compared to traditional capacitive discharge systems.
- Numerous remote control/monitoring options maximize system flexibility. Remote control/monitoring can be accomplished via:
 - Individual 24 VDC, 48 VDC or 120 VAC hard-wired copper connections

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Theory of Operation

ADB SAFEGATE's sequenced-flasher lighting systems include a master control unit, junction boxes, individual control cabinets (ICC), and either elevated or in-pavement flasher units. For MALSR systems, a 15 kVA transformer is also provided to power the steady-burning lights.

In the ALSF configuration, an array of light bars are installed symmetrically around the centerline of the approach lighting system, starting at the approach threshold and extending a total distance of 2,400 feet (731.5 m) outward into the approach zone up to 3,000 feet (914 m) at facilities where high-speed military aircraft share runway usage. Up to 21 flashing lamp assemblies (30 for ICAO applications) are installed in the outer portion of the approach lighting system at regular intervals.

In the MALSR configuration, an array of light bars are installed symmetrically around the centerline of the approach lighting system, starting at the approach threshold and extending a total distance of 2,400 feet (731.5 m) into the approach zone and up to 3,000 feet (914.4 m) at facilities where high-speed military aircraft share runway usage. Typically, up to 8 flashing lamp assemblies are installed in the outer portion of the approach lighting system at regular intervals.

The MALSR system uses white 120 VAC PAR-38 fixtures for the light bar arrays. Also, the MALSR system uses green 120 VAC PAR-56 fixtures for the threshold bar. The ALSF system uses white or red PAR-56 6.6 A or 20 A fixtures for light bar arrays and green PAR-56 6.6 A or 20 A fixtures for the threshold bar.

Flashing lights are arranged and connected in such a way as to produce a sequenced flashing light signal that has the appearance of a ball of light traveling down the system from the outer end (flasher farthest from the runway threshold) to the flasher assembly closest to the runway threshold.

Note: See ADB Safegate data sheet 1042 for more details on ALSF or MALSR PAR-56 fixtures.

Master Control Cabinet

The master control cabinet contains control and monitoring PCBs, which provide the power, timing signals, misfire monitoring circuitry, and three-step intensity control signals to the sequenced flasher assemblies in remote and local mode.



MCC Ordering Code

44A6763 - X X X X X 0 X

System

- 1 = ALSF per FAA-E-2628 or ICAO
- 2 = MALSR per FAA-E-2325
- 3 = MALSR per FAA-E-2980
- 4 = UDAL¹
- 5 = ALSF per 2628 Stainless Steel

Flashers

XX = Maximum number of flashers

Examples:

- 08 = 8 flashers
- 21 = 21 flashers
- 30 = 30 flashers (ICAO applications)

Monitoring²

- 1 = Without monitoring
- 2 = With monitoring

Input Voltage

- 1 = 120/240 VAC (standard)

Surge Protection

- 2 = Monitored surge protection³

0

Remote Connection – Hardwired

- 0 = None
- 1 = +24 VDC
- 2 = +48 VDC
- 3 = 120 VAC

Notes

¹ A special Unidirectional Approach Lighting (UDAL) system can also be configured. Contact the ADB SAFEGATE Sales Department for details. A UDAL consists of 5 unidirectional sequenced flashers and 2 unidirectional REILs.

² Monitoring required for ALSF systems per FAA-E-2628

³ Includes 40 kA surge protection devices in each ICC. Surge protection status monitored electronically.

Master Control Cabinet Equipment Data

Input and Output Voltage	120/240 VAC, +10%/-15%, 50/60 Hz, three-wire, single-phase (neutral center-tapped)
Time from Trigger Pulse to Trigger Pulse	In ALSF mode, corresponds to one cycle of 60 Hz line, 16.67 ms. In SSALR mode, corresponds to every other cycle of the 60 Hz line or 33.3 ms. For MALSR, corresponds to every other cycle of the 60 Hz line or 33.3 ms.
Enclosure	NEMA 4, outdoor and ventilated (to prevent condensation)
Maintenance Features on Control Cabinet	<ul style="list-style-type: none"> Rotary control switch for manual control of brightness level of system Flasher ON/OFF switch to de-energize flashers (if desired) when the approach lights are energized LED indicators for system monitoring Service entrance switch disconnects incoming power 100 W maintenance light Can lock door in a 120° open position
Lightning Protection	Rugged surge protection on all input and output electrical connections

Voltage	Dimensions	Weight
120/240 VAC (standard)	37.25 x 30 x 11.38 in	137 lb
	94.6 x 76.2 x 28.9 cm	62 kg

Master Input Power Requirements

Voltage	Max. No. of Flashers	Max. Power Req. ALSF	Max. Power Req. MALSR
120/240 VAC	3	4 kVA	18 kVA
	5		19 kVA
	6	5 kVA	
	8		20 kVA
	9	6 kVA	
	12	7 kVA	
	15	8 kVA	
	18	9 kVA	
	21	10 kVA	

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Individual Control Cabinet (ICC)

Each flasher fixture is controlled by an individual control cabinet, which houses triggering circuits, terminal blocks, and lightning arresters. A safety interlock switch is incorporated into the enclosure to discharge the flash lamp power circuitry when the cabinet door is opened. The ICC can connect to one flasher or optionally, 3 flashers. ICC includes anti-condensation heaters, which are active when power is applied.



ICC Ordering Code

44A6764 - X X X 0

System

- 1 = ALSF per FAA-E-2628/ICAO Annex 14
- 2 = MALSR per FAA-E-2325
- 3 = MALSR per FAA-E-2690
- 4 = UDAL

Flasher Quantity

- 1 = One Flasher Unit
- 3 = Three Flasher Unit

Surge Protection

- 2 = 80 kA Surge Protection

Notes

- For ICC to Flash Head line lengths up to 131 ft (40 m) maximum, use ADB SAFEGATE Part No. 89A0290-5.
 - Wire is 5/C, 14 AWG, 600 V, shielded
 - Cable is Alpha Part No. 65405CY-SL
 - Cable comes in standard rolls of 1,000 feet.
- For line lengths up to 213 ft (65 m), use 12 AWG. For line lengths up to 328 ft (100 m), use 10 AWG. For Line lengths up to 383 ft (120 m), use 8 AWG.
- Serial communication wiring between Master and each ICC must be ADC Wire Part No. 6801T05, 18 AWG, Triad, shielded, 600 V cable or ADB SAFEGATE approved equivalent.

ICC Equipment Data

Enclosure	Outdoor, door handle can be padlocked	
Input Voltage	240 VAC, 50/60 Hz	
Input Current	2 A in high intensity (average)	
Flash Lamp Output Voltage	400 VDC	
Intensity Step Change Component Life	150,000 operations minimum	
Protection	Rugged surge protection on all external wiring connections	
Mounting	Two 2-inch (5.08 cm) threaded fittings are provided on bottom of cabinet for mounting. Mounting lugs are also provided on back of the cabinet.	
Installation Distance	ICC can be installed a maximum of 393 ft (120 m) from flasher	
Dimensions	H × W × D	
1-in-1 ICC	20 × 16.5 × 9.25 in (50.8 × 41.9 × 23.5 cm)	
3-in-1 ICC	25.6 × 31.1 × 15 in (65 × 79 × 38 cm)	
Weight	1-in-1 ICC	3-in-1 ICC
	40.8 lb (18.5 kg)	103.6 lb (47 kg)

Junction Box (44A6765)

Junction boxes are used to distribute power and control signals to the ICCs. One junction box is required for each sequenced flasher in the system. Each junction box has two terminal strips to accommodate all wires used for the flasher unit.



Junction Box Equipment Data

Quantity	One for each flasher unit
Conduit Hub	Two 2-inch hubs in the bottom of the box
Dimensions	14 × 14 × 6 in (35.56 × 35.56 × 15.24 cm)
Weight	15 lb (6.8 kg)

Elevated Flasher

Each elevated flash head assembly consists of a flashing light head, which houses a low-voltage (400 VDC) flash tube and a trigger transformer. A safety interlock switch disconnects the individual control cabinet (ICC) power when the flash head is opened. The elevated flash head is rated IP45.



In-pavement Flasher

Each in-pavement fixture houses a low-voltage (400 VDC) flash tube and trigger transformer. A safety interlock switch disconnects the individual control cabinet (ICC) power when the bottom cover is removed.



In-pavement Fixture with Mating Female Connector

In-pavement flasher height is 0.75 inch without the snow plow ring and fits on a standard FAA 12-inch base can. Fixture height is 0.5 inch with the snow plow ring. The ring adapts from 12 inches to 16 inches and is mounted on an FAA L-868C base can.



In-pavement Fixture with Snow Plow Ring

Flasher Ordering Codes

Elevated Flasher¹	1UE9C2Y00001
LIR Mounting Adapter ²	4762
In-pavement Flasher^{3, 4}	44A7445
Mating Female Connector (59" long)	73A0174
Snow-Plow Ring LB4 - 3/8-16 UNC	4072.37.320
Lifting Device ⁵	1420.55.600

Notes

- ¹ Flash head includes lamp.
- ² Must use LIR mounting adapter if mounting to an LIR mast or 2-inch EMT.
- ³ Includes 5 conductor cable with 12" long male plug.
- ⁴ For FAA owned and operated flashing systems use FFL9C0000001.
- ⁵ Lifting Device allows in-pavement flashing fixture to be quickly and easily removed from its mounting system during maintenance activities.

Flasher Equipment Data

Input Voltage	400 VDC
Lamp	Xenon flash tube
Lamp Life	Average 500 hours on high-intensity step
Intensity Decrease	30% or less over minimum rated lamp life
Flash Skipping	Less than 1% with no consecutive skipping
Elevated Light Beam Axis	Adjustable vertically from the horizontal to 25° above the horizontal
Vibration	Withstands vibration in frequency range of 10 to 2,000 Hz in accordance with NEMA Standard FA1-3.01
Elevated Mounting	On a 2-inch (5.08 cm) frangible coupling or 2-inch EMT conduit, or 1.5-inch (3.81 cm) OD tube or 1.5-inch schedule 40 pipe. Mounting can be on a 1-inch (2.54 cm) pipe (used on an aluminum tower) using Mounting Adapter.
Installation Distance	A maximum of 393 ft (120 m) from ICC
Elevated Dimensions	10.6 × 5.75 × 6.7 in - H × W × D (27 × 14.6 × 17 cm)
In-pavement Dimensions	Fits on standard 12-inch base can. Overall Di-height is 6 inches.
Elevated Wt.	4 lb (1.8 kg)
In-pavement Weight	16.5 lb (7.5 kg)

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Photometric Data

Intensity Setting	Maximum Effective Intensity	Minimum Effective Intensity	Beam Spread	
			Horiz.	Vertical
Elevated Fixture				
High	20,000 cd	8,000 cd	±15°	+10°
Medium	2,000 cd	800 cd		
Low	450 cd	150 cd		
In-pavement Fixture				
High	20,000 cd	5,000 cd	±15°	+2 to +12°
Medium	2,000 cd	500 cd		
Low	600 cd	150 cd		

Flasher Tester

Flasher Tester functionality is accomplished using the flasher tester software (CD included with the dongle) installed on a laptop. A separate portable flasher tester tool is not used with the Low-Voltage ALSF/MALSR Approach Lighting System.

The flasher testing software provides advanced monitoring and on-site configuration capabilities. The software may be loaded onto a customer supplied laptop or a laptop provided with the system (optional). The laptop is connected to the MCC or any ICC using the Flasher Tester Dongle. The software provides user-adjustable parameter setting and configuration functions and detailed individual status monitoring screens.

Flasher Tester Ordering Codes

Dongle ¹	1444.00.010
Laptop Computer	44A6002/012

Notes

¹ Includes CD software that can be loaded on any Windows™ based laptop.

Aiming Devices

Elevated FAA Steady-Burning Lamps

Aiming devices can be used on either ground mounted lights or when the lights are mounted on low impact resistant structures conforming to FAA-E-2604 or FAA-E-2702. The aiming device is used to adjust the vertical elevation angle of PAR-38 and PAR-56 steady-burning lamp holders. The aiming device permits aiming of the lamp axis perpendicular to the plane of the cover glass at any angle from 0° to +25° above the horizontal. The aiming angle can be calibrated in 1° intervals, and the actual aiming angle of the lamp holder with the aiming device attached is accurate to within ±0.5°.



Note: For ICAO elevated steady-burning fixture applications, refer to ADB SAFEGATE data sheet 3031.

Elevated Flashing Fixtures

This aiming device is used to adjust the vertical elevation of the elevated flash head. For elevated flashing fixture, the aiming device is available either as an electronic or as a simple mechanical (bubble level) based unit. Both aiming devices are accurate to within ±0.5°.

Elevated Aiming Device Ordering Codes

Steady Burn PAR-56 only	44D1654/1
Steady Burn Par-56 and PAR-38	44D1654/2
Flasher Electronic Aiming Device ¹	1570.05.400
Flasher Bubble-Level Aiming Device ²	1570.05.410

Notes

¹ For inaccessible fixture mounting heights up to 33 ft (10 m).

² For fixture mounting heights accessible from the ground, a ladder or a bucket truck.

PAR-38 Lamp Holder (44C1683)

There are 45 clear PAR-38 lamp holders mounted five to a light bar in the runway approach. Each lamp holder is designed to accommodate 60 W up to 150 W, 120 VAC PAR-38 lamps. An adjustable base on the lamp holder permits vertical adjustment from the horizontal to 25° above the horizontal. Also, the mounting hardware permits horizontal alignment of the light beam axis to any horizontal angle within +1°. The lamp holder has a mounting base that mounts on the open top of a frangible coupling, on a light bar with an adapter sleeve, or to a 2-inch (EMT) conduit.

Note: 60 W, 120 VAC PAR-38 lamps are sold separately. Use part number EA00001-000-01.

PAR-38 Equipment Data

Quantity	45 total
Installation	Five PAR-38 lamp holders are installed on a light bar (Nine light bars in system)
Dimensions	9 × 3 × 3 in (22.9 × 7.6 × 7.6 cm)

PAR-56 Lamp Holder

Eighteen PAR-56 lamp holders are installed on the runway threshold. The lamp holder has mounting clips to hold the green filter and is designed to accommodate a 300 W, 120 VAC PAR-56 lamp. Each lamp holder has an adjustable base for vertical adjustment and mounts to a 2-inch EMT conduit or on top of a frangible coupling. PAR-56 lamp holders are ordered separately. See ADB SAFEGATE data sheet 1042 for more information.



PAR-56 Ordering Code

44D1661 - X X X X

Shorting Device

- 0 = Includes Shorting Device for 6.6 A Lamps*
- 1 = Includes Shorting Device for 20 A Lamps
- 2 = Without Shorting Device

Filters

- 1 = Clear (no filter)
- 2 = Green Filter
- 3 = Yellow Filter
- 4 = Red Filter
- 5 = Blue Filter (special order only)

Cord Set

- 1 = With L-823 Cord Set (used with shorting device)
- 2 = Without L-823 Cord Set
- 3 = With L-823 Cord Set (used without shorting device)

Slip Fitter

- 1 = Slip fitter for 2-in EMT, 1.5-in Tube & Tower
- 2 = Slip fitter for 1.5-in Schedule 40 Pipe and Frangible Coupling (62B0064)

Notes:

- Lamps and optional accessories must be ordered separately.
- * For 200 W lamps only

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FAA MALSR 15 kVA Power Transformer (44D1685-1)

The 15 kVA, 50/60 Hz power transformer powers the steady-burning PAR-56 and PAR-38 lights. Taps on the transformer are switched electronically by the master control cabinet to provide power at any one of three voltage levels to the steady-burning lights. Taps provided on the primary of the transformer permit secondary voltage adjustment to within 2.5% of the required secondary output assuming the primary voltage is between 210 V and 252 VAC. The transformer is housed in an outdoor, rain-tight enclosure with lugs provided on the back of the enclosure for mounting the cabinet in a vertical position. Two lightning arresters are provided for input and output lightning protection.



Power Transformer Equipment Data

Quantity	One	
Rating	15 kVA	
Input	210-252 VAC, 50/60 Hz	
Taps	Provided on primary to permit adjustment of secondary voltages	
Output Voltage	<u>Intensity Step</u>	<u>Secondary Output</u>
(when connected to 240V AC primary input)	Low	50/100 VAC $\pm 0.5\%$
	Medium	75/150 VAC $\pm 0.5\%$
	High	120/240 VAC $\pm 0.5\%$
Dimensions	13.25 x 12 x 18 in (33.7 x 30.5 x 45.7 cm)	
Weight	262 lb (119 kg)	

Spare Parts Trunk

Spare Parts Trunk includes spare PCBs for the MCC, ICCs, and flashers.

Spare Parts Ordering Code

44A6767 - 0 X X 0

Remote Connection – Hardwired

- 0 = None
- 1 = +24 VDC
- 2 = +48 VDC
- 3 = 120 VAC

Flashers

- 0 = Elevated and In-pavement Flashers
- 1 = Elevated Flashers Only
- 2 = In-pavement Flashers Only

FAA ALSF Ordering Information

The following equipment is to be supplied for the ALSF-1, ALSF-2, and ALSF-2/SSALR approach lighting systems per FAA-E-2628:

Quantity	Description
1	Master Control Cabinet
Up to 21	Flashing Light Heads
Up to 21	Individual Control Cabinets
Up to 21	Junction Boxes
1	Steady-Burning Aiming Device
1	Elevated Flasher Aiming Device
1	Flasher Tester Equipment
1	Instruction Manual

Note: Additional equipment may be required, but must be ordered separately:

- PAR-56 Lamp Holder Assemblies
- PAR-56 Lamps
- Frangible Couplings
- Low Impact-Resistant Structures
- Spare Parts Trunk
- L-830/L-831 Isolation Transformer or 1500 W, 20 A/20 A, Isolation Transformer
- For in-pavement FAA-E-2952 (Replacement for 2491) ALSF high-intensity system applications, see ADB SAFEGATE data sheet 2029 for details.

FAA MALSR Ordering Information

The following equipment is to be supplied for the MALSR approach lighting systems per FAA-E-2325:

Quantity	Description
1	Master Control Cabinet
3 to 8	Sequence Flasher Heads
3 to 8	Individual Control Cabinets
3 to 8	Junction Boxes
1	15 kVA Power Transformer
45	PAR-38 Lamp Holders
18	PAR-56 Lamp Holders
1	Flasher Tester Equipment
1	Steady-Burning Aiming Device (PAR-38/-56)
1	Elevated Flasher Aiming Device
1	Spare Parts Trunk
1	Instruction Manual

Note: Additional equipment may be required, but must be ordered separately:

- PAR-38, 150 W, 120 VAC lamps
- PAR-56, 300 W, 120 VAC lamps
- Frangible couplings
- Low impact-resistant structures
- For in-pavement FAA-E-2968 MALSR medium-intensity system, Style I, unidirectional white applications, use part number 44A6440-2000. This fixture uses one 105W lamp and is photometrically equivalent to the older style 200W L-850B fixtures that were used in this application. See data sheet 2029 for more details.
- For in-pavement FAA-E-2968 MALSR medium-intensity system, Style II, unidirectional green applications, use part number 44A6440-1000. This fixture uses three 62 W lamps and is photometrically equivalent to the older style 200 W L-850E fixtures that were used in this application. See data sheet 2029 for more details.
- Encapsulated (FAA Style) isolation transformers are available for voltage-driven, medium-intensity approach lighting applications. For 105 W, 240 VAC to 15.9 VAC applications, use part number 35C0095. For three 62 W lamp applications, a 186 W , 240 VAC to 28.2 VAC transformer is used (Part No. 35C0096).