An Introduction to Airport Airfield Lighting
Opening Remarks

• William H. Maxwell, PE
  – 25 years as an electrical engineer, licensed in 10 states.
    • 4 years designing power distribution for airports sizes:
      – Dansville, NY R/W 18-36 →2443 ft
      – Detroit, MI R/W 04R/22L →12003 ft

• Per FAA ’11-’13 over 726M Passengers traveled from 387 Primary Airports

• Airfield Lighting Systems
Design Regulations & Codes

• Consulting engineering
• FAA A/C -- Advisory Circulars
    – 122 advisory circulars
    – We use AC 150/5340-30G for lighting
    – These are the rules of the road.... oh, ah, Airfield.
• FAA Field Inspectors
• NEC vs A/C
Power

• Parallel & Series distribution (both are used)
• Airfield lighting circuits:
  – Bad Axe, MI – R/W 07/25 →2523 ft.
    • Series circuit length ~~~ 5846 ft.
    • Series circuit length ~~~ 25,516 ft. (1 mile = 5,280’)
• Electricity Distribution vs. Material Cost
  – (3)-500 kcmil 600V conductors
  – (1)-#8 AWG 5KV conductor
• Risk vs. the Qualified Person
L-828 Constant Current Regulator

Manufacturers
- ADB
- Crouse Hinds
- Flight Light
- Manairco
- Astronics

ADB Cut Sheet

Signature Series™
L-828/L-829 Ferroresonant Air-Cooled Regulator

Compliance with Standards
FAA: L-828, L-829 AC 150/5345-10 (Current Edition)
ETL Certified.
ICAO: Aerodrome Design Manual Part 5, para. 3.2.1.4
and 3.2.1.6.
Military: UFC 3-535-01; NAVAIR 51-502A-2

Features
- Advanced CCR architecture produces minimal EMI, high efficiency, and near unity power factor for AC 150/5345-10 test conditions, exceeding FAA and military requirements for power factor and efficiency. Advanced architecture has excellent input power factor and efficiency at all intensity steps and lower loads.
- Does not exceed the conducted power line emission limits given in Table 4 of AC 150/5345-10 with testing as specified in the Code of Federal Regulations (CFR) Title 47, Subpart B, Section 15.107b. Does not exceed the radiated emission limits given in Table 5 of AC 150/5345-10 with testing as specified in the Code of Federal Regulations (CFR) Title 47, Subpart B, Section 15.108b.
- Optional integrated ACE™ unit provides state-of-the-art remote control and LCD viewing capability. Unique cycle mode allows output True RMS current and voltage, VA, watts, lamps-out, and series circuit insulation resistance value to be alternately displayed. A visual indication is also provided for all other FAA-monitored parameters, including open-circuit, overcurrent, loss of input power, loss of input voltage, low VA (drop in load VA of 10%), Remote/Local status, and incurred output current.
- No input turn on inrush current surge

Power Equipment

Theory of Operation
Ferroresonant circuitry and a solid-state control system accurately regulate the output current to within the FAA-allowable range from no load to full load and with input voltage variations of -10% to +10% of nominal.

ACE™ Unit
The optional ACE™ unit provides L-829 monitoring and optional metering or CCR input monitoring capability. Each unit is installed locally at each CCR that requires remote control and/or monitoring within the airborne lighting electrical vault. Optional CCR input monitoring monitors the following:
- CCR input current
- CCR input voltage
- CCR input watt-amps (VA)
- CCR input power (watts)
- CCR input power factor
- CCR% efficiency
- CCR run-time by step
- CCR cycle count

The ACE™ unit is also a component of ADB’s distributed control
L-828 continued

• Sizes – 4kw, 7.5, 10, 15, 20, 30
  – Input voltages – 208, 240, 480

• The size correlates to the lighting & sign load.

• Typical L-828
  – Input: 240V 1Ø2W 60 Hz.
  – Output: 1-5000V 1Ø1W 60 Hz.
  – 6.6 Amps → 3 steps or 5 steps
Utility 120/240V 1Ø3W

(2) #3 AWG CU THWN
(1) #8 AWG CU GND IN 1" EMT

300 A 90 A

As per panel schedule

L-828 15 KW

(1) #8 AWG 5KV L-824

L-851 T & L-830

T/W A

MDP
Runway / Taxiway Lighting

- Types of lighting technology
  - Incandescent, Halogen, Quartz, & LED
  - 60 watts to 14 watts
- Types of Elevated Edge Lighting
- L-860/1/2 E/T
- Types of In-Pavement Edge Lighting
- L-850
# Calculating Circuit Load

<table>
<thead>
<tr>
<th>TC-1 MEDIUM INTENSITY TAXIWAY LIGHT LOAD</th>
<th>EXIST. QTY.</th>
<th>PROP. QTY. (ADDED)</th>
<th>QTY. REM.</th>
<th>WATTS</th>
<th>TOTAL WATTS</th>
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<tr>
<td>MEDIUM INTENSITY TW EDGE LIGHTS</td>
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<td>59</td>
<td>23</td>
<td>15</td>
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<td>0</td>
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<td>TOTAL KW LOAD</td>
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<td>10.11</td>
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<td>EXISTING REGULATOR (KW)</td>
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<td>PROPOSED 15 KW REGULATOR</td>
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<td>USE A CCR WITH A 6.6 AMP PRIMARY CURRENT</td>
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</table>
References

• NFPA NEC 70

• FAA – Engineering and Design
  – http://www.faa.gov/airports/engineering/

• ADB
Questions?
FAA Designators

- L-801 and L-802
  - Rotating Beacons
- L-804
  - Elevated Runway Guard Light
- L-806 and L-807
  - Wind Cone
- L-810
  - Obstruction Lights
- L-821
  - Control Panels
- L-823
  - Connector Kits
- L-824
  - Airfield Wire
- L-827 and L-828 and L-829
  - Standalone CCR monitor
- L-828
  - CCR without monitoring
- L-829
  - CCRs with monitoring
- L-830
  - 60Hz Isolation Transformer
- L-831
  - 50Hz Isolation Transformer
- L-841
  - Auxiliary Control Panel
- L-847
  - Circuit Selector Switch
- L-849
  - REIL
- L-850A
  - Runway Centerline and LAHSA Lights
- L-850B
  - Touchdown Zone Lights
- L-850C
  - Runway Edge Lights
- L-850D
  - Runway End Lights
- L-850E
  - Runway Threshold Lights
- L-850F
  - LAHSA light
- L-852A/B/C/D/J/K
  - Taxiway Centerline Lights
- L-852E/F
  - Taxiway Intersection Lights
- L-852G
  - In-pavement RGL
- L-852S
  - Stop Bar Lights
- L-853
  - Retro reflective Markers
- L-854
  - Radio Control
- L-858
  - Signs
- L-860/E
  - Low Intensity Elevated Lights
- L-861/E/T/SE
  - Medium Intensity Elevated Lights
- L-862/E
  - High Intensity Elevated Lights
- L-862S
  - Elevated Stop Bar Light
- L-867/L-868
  - Base Cans
- L-880/L-881
  - PAPI
- L-884
  - LAHSA Power and Control Unit (PCU)
- L-890
  - ALCMS