Runway Status Lights

RWSL Production System Overview

Federal Aviation Administration

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By: RWSL Program Management Office

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Agenda

- **Operational Concept**
- **Production RWSL System Hardware Overview**
- **Upgrade Equipment to Production RWSL System**

Operational Concept

- Automatic Performance Monitoring and Control
  - Continuous System Operational Status Reporting
  - Automatically Adjusts All Field Light Fixture Intensities to Adaptable Night and Day Settings
  - Automatically Adjusts to Changes in Directional Flow of Traffic without User Input

- Autonomous Failure Detection, Diagnostics, and Fault Isolation
  - Faulted Components are Automatically Changed to an Offline State
  - Critical Faults Result in the Entire RWSL System Being Taken Offline

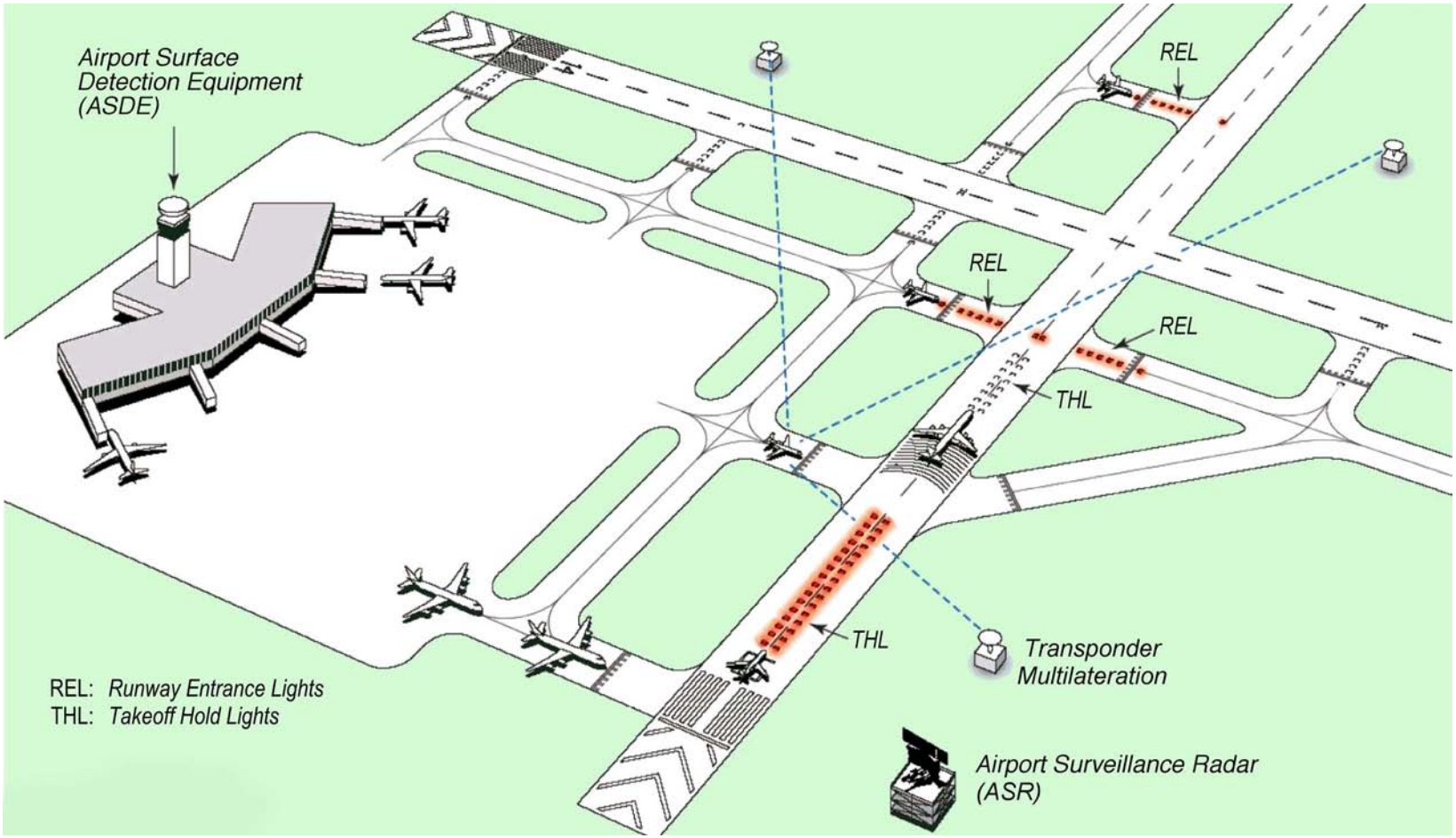
RWSL Objective

- RWSL Objective: Reduce the number of runway incursions without interfering with normal and safe airport operations
- The RWSL system reduces runway incursions by indicating to pilots and vehicle operators that a runway is unsafe for entry or crossing or that a runway is unsafe for departure
- Runway status lights display critical, time-sensitive safety status information directly to pilots and vehicle operators via in pavement lights giving them an immediate indication of potentially unsafe situations
- RWSL is a passive system that serves as an **added layer** of safety for the runway environment
- Runway status lights indicate runway status only; they do not indicate clearance

System Description

- The RWSL system integrates approach and surface surveillance systems with airport lighting equipment to provide a visual signal to pilots and vehicle operators indicating that it is unsafe to enter/cross or begin takeoff on runway
- The system is fully automated based on inputs from surface and terminal surveillance systems
- Airport surveillance sensor inputs are processed through light control logic that commands in-pavement lights to illuminate red when there is traffic on or approaching the runway
  - ***Runway Entrance Lights (REL)*** provide signal to aircraft crossing or entering runway from intersecting taxiway
  - ***Takeoff Hold Lights (THL)*** provide signal to aircraft in position for takeoff

Conceptual Diagram of the RWSL System



RWSL REL and THL Arrays

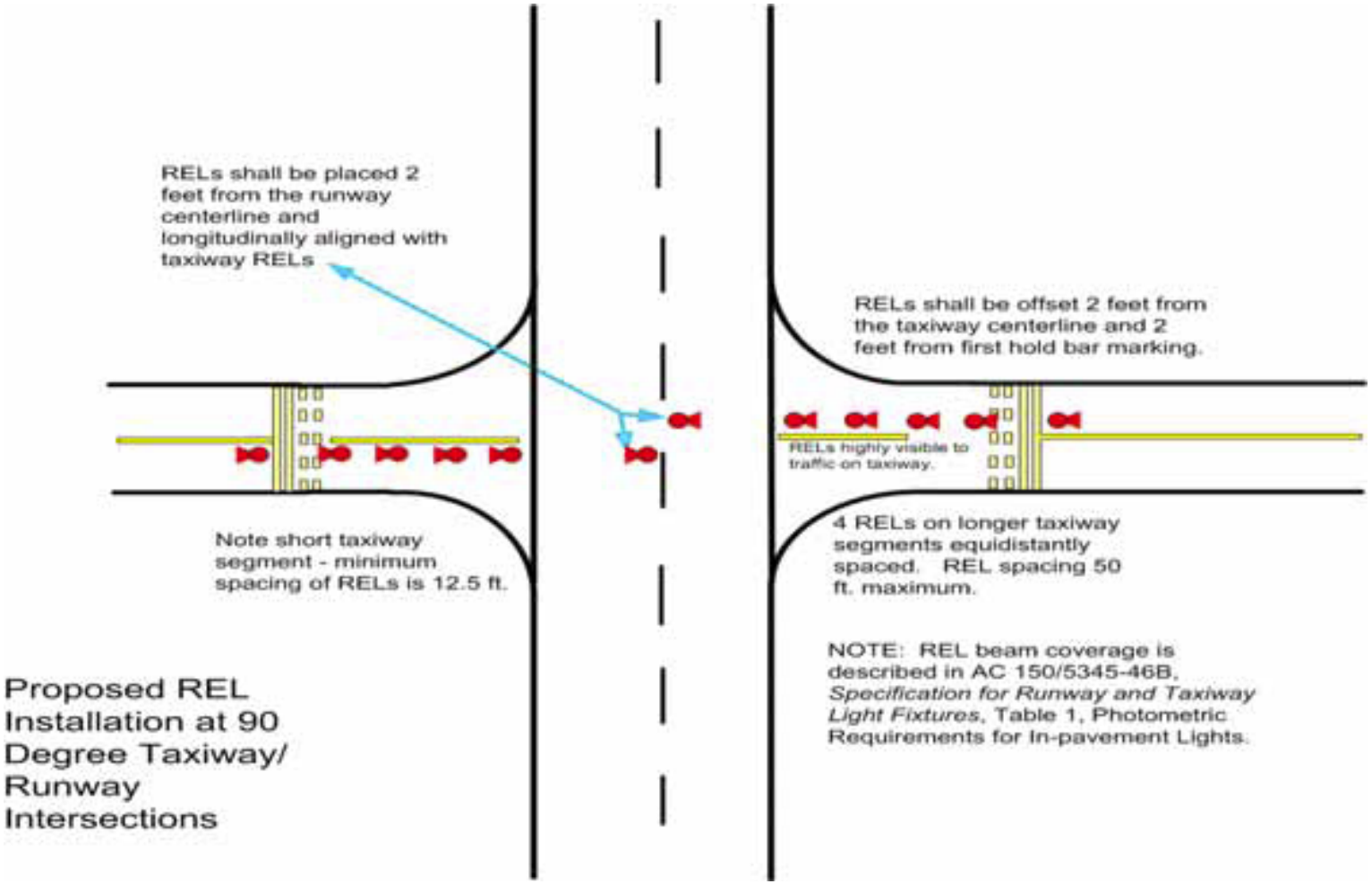
Runway Entrance Lights (RELs) L-852S

6 lights minimum per REL array (Includes one on Runway center line)

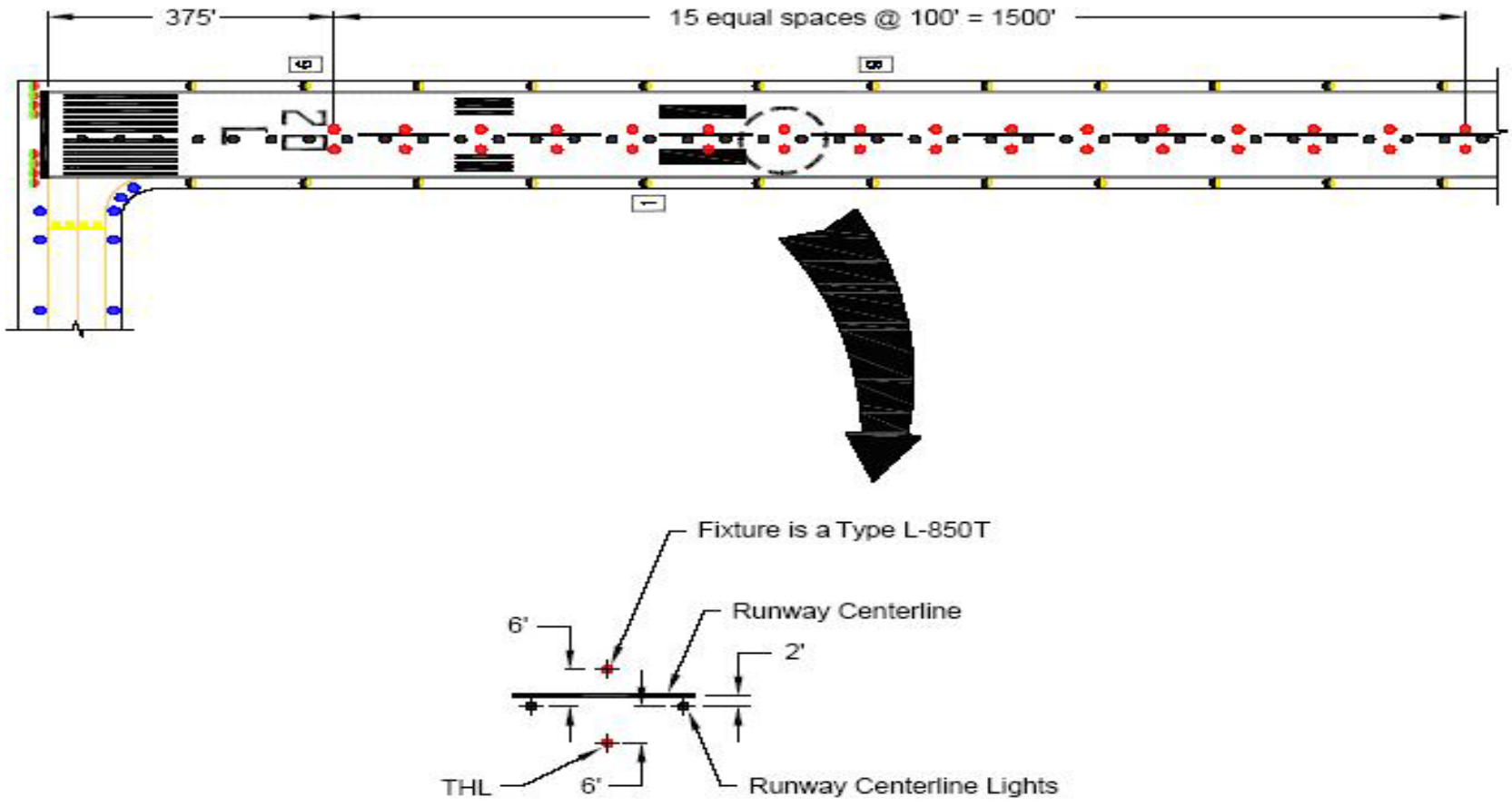
Takeoff Hold Lights (THLs) L-850T

6’ on either side of RW CL lights, spaced 100’ for 1500’ – 32 lights/array Start 375’ from the runway threshold

REL Array


RELs shall be placed 2 feet from the runway centerline and longitudinally aligned with taxiway RELs
RELs shall be offset 2 feet from the taxiway centerline and 2 feet from first hold bar marking.
RELs highly visible to traffic on taxiway.
Note short taxiway segment - minimum spacing of RELs is 12.5 ft.
4 RELs on longer taxiway segments equidistantly spaced. REL spacing 50 ft. maximum.
NOTE: REL beam coverage is described in AC 150/5345-46B, *Specification for Runway and Taxiway Light Fixtures*, Table 1, Photometric Requirements for In-pavement Lights.
Proposed REL Installation at 90 Degree Taxiway/ Runway Intersections

THL Array



Proposed Runway THL Locations

Production RWSL System Hardware Overview

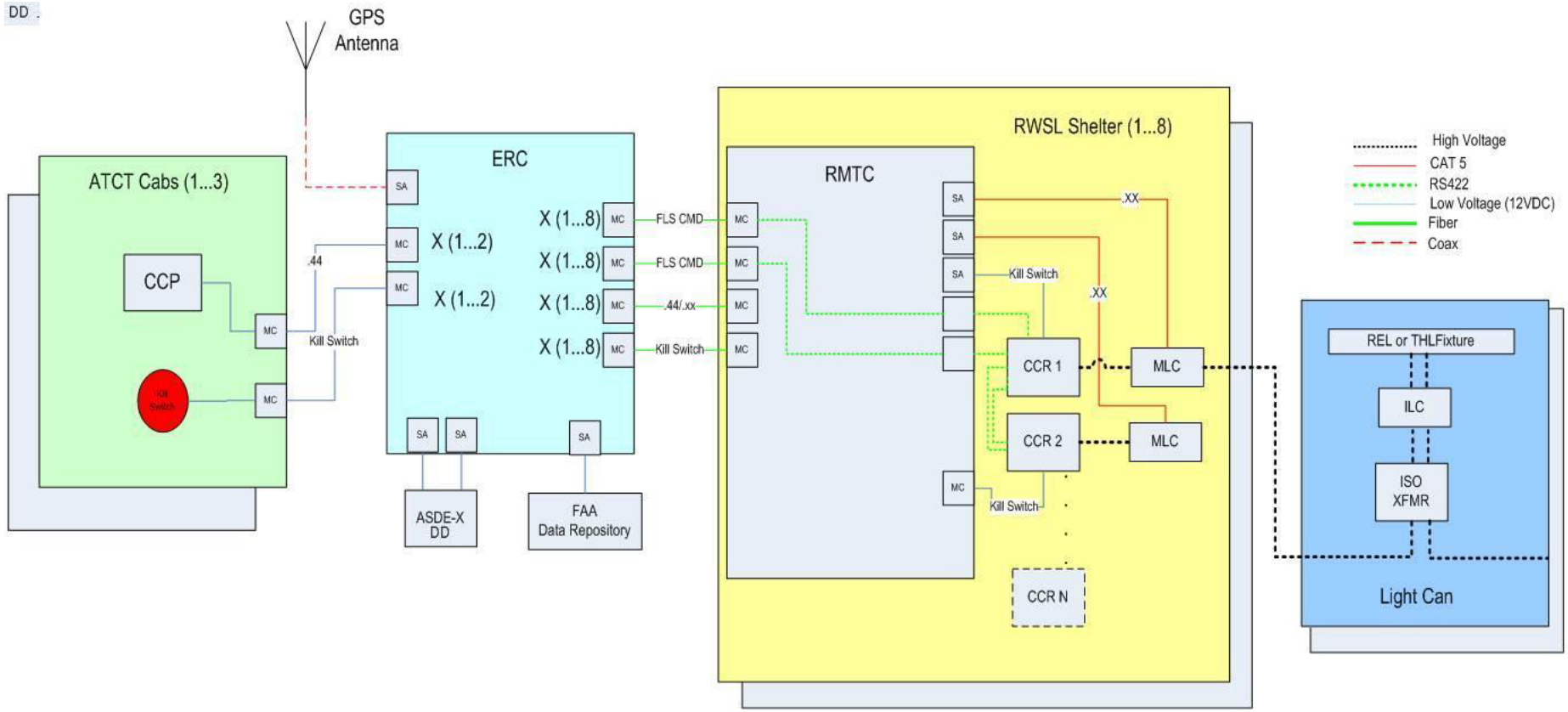
Equipment Locations

- Tower Cab
- Tower Equipment Room
- Airfield Shelter
- Field

RWSL System Components

- Tower - Cab
  - Cab Control Panel
  - Kill Switch
- Tower - Equipment Room Cabinet (ERC)
  - RWSL Processor (RP)
  - Maintenance Terminal (MT)
  - Recorder
  - Field Light Computer
  - Time Server
  - Communications Equipment
- Lighting Shelter Equipment
  - Master Light Controllers
  - Constant Current Regulators
  - Remote Equipment Cabinet
    - Remote Maintenance Terminal
    - Communications Equipment
- Field Equipment
  - Light Fixtures (THL & REL)
  - Individual Light Controllers
  - Isolation Transformer
  - Light Can

RWSL System Components



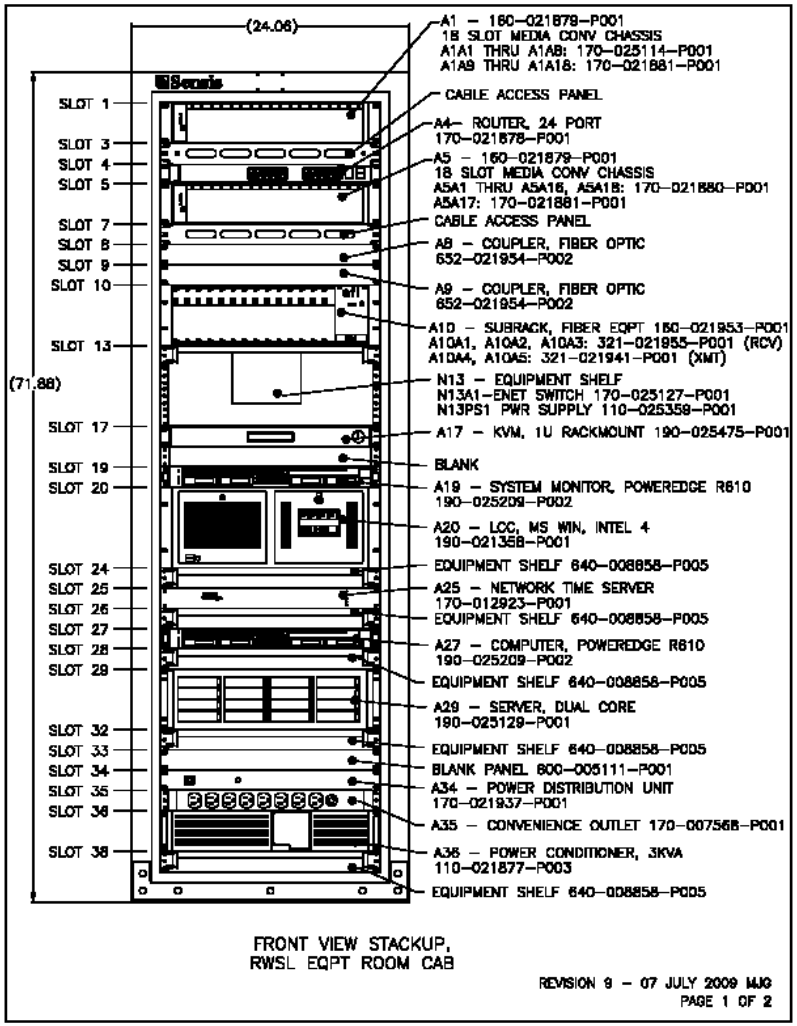
Tower Cab: CPP Panel

- AT Supervisor Interface to RWSL System
- Allows control of intensity of RELs and THLs
- Provides system status
- One per ATCT

Tower Cab: Kill Switch

- System shut down via direct control of CCRs
- One per ATCT

Equipment Room Cabinet (ERC)



ERC: RWSL Processor

- Receives surveillance data from the ASDE-X system
- Processes surveillance data to determine correct state of all RELs and THLs
- Sends light commands to the Lighting Computer

ERC: Light Computer (LC)

- Receives light commands from RWSL processor
- Distributes light commands to all of the field lighting shelters

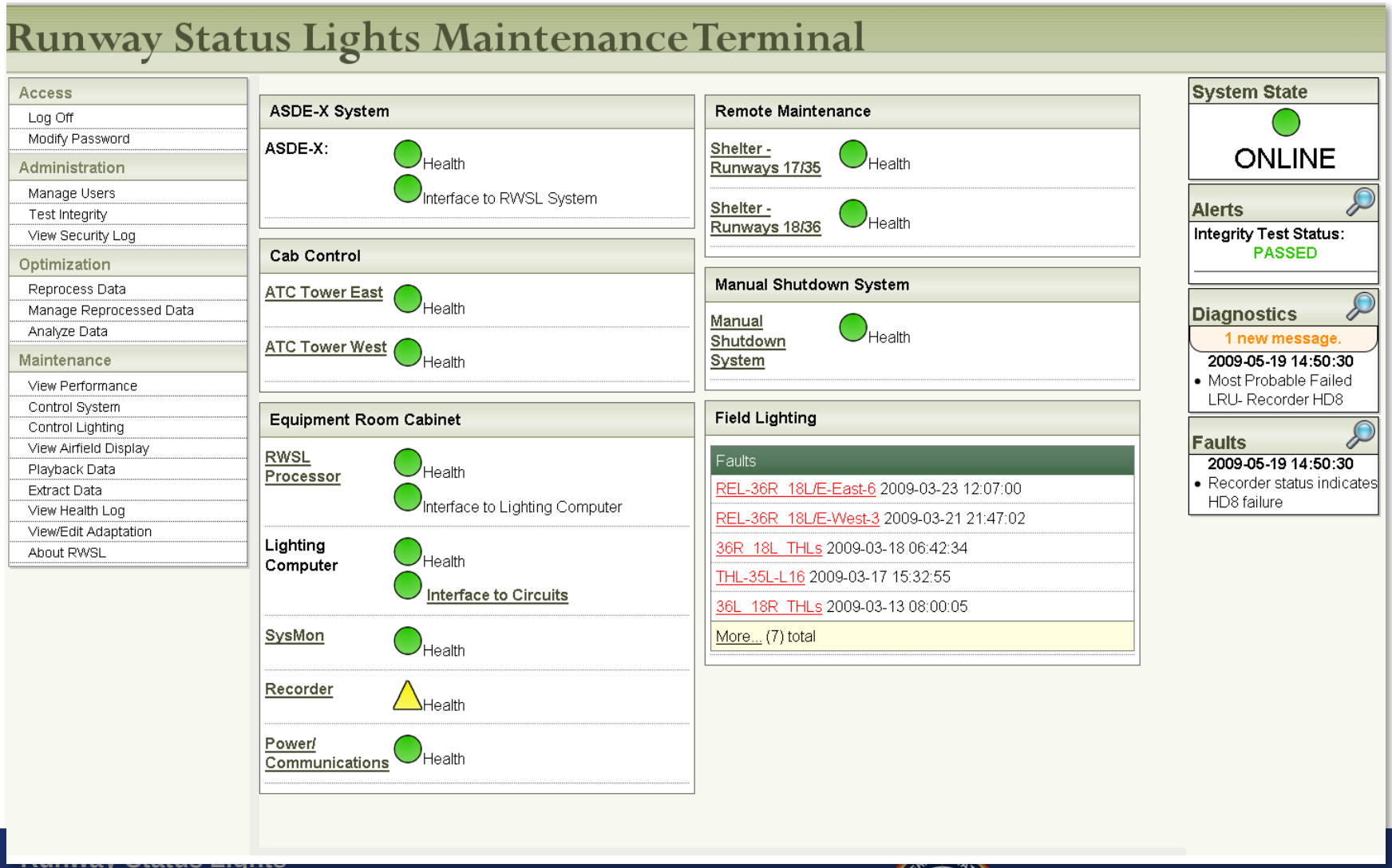
ERC: Recorder

- Records all ASDE-X input data, light commands, and performance monitoring data
- Provides backup/restore functionality
- 15 Hard Drives, 1 extra bay

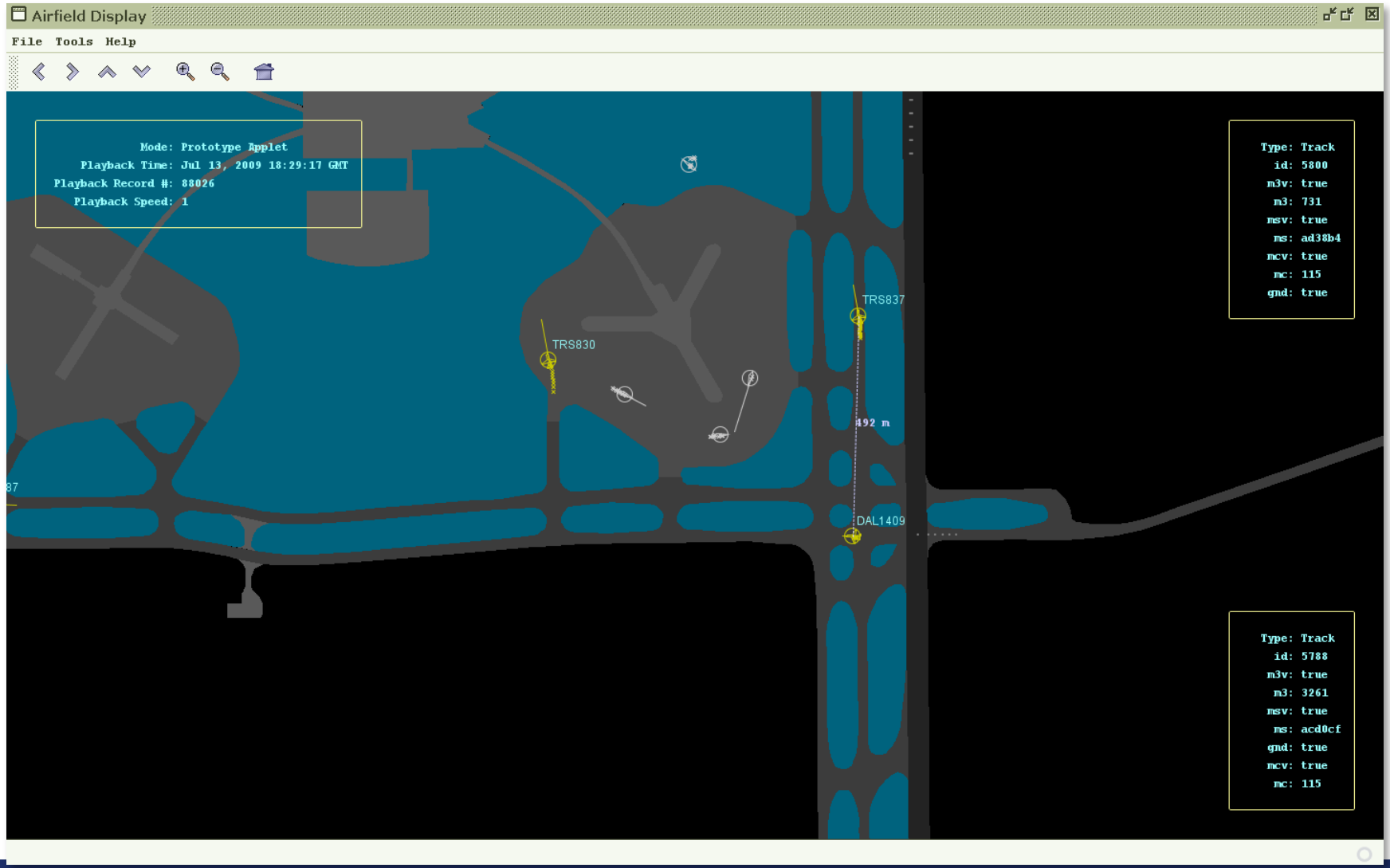
ERC: Maintenance Terminal

- Provides user interface to the RWSL Processor, Recorder and FLS
- Includes keyboard, monitor and touchpad

ERC: Maintenance Terminal

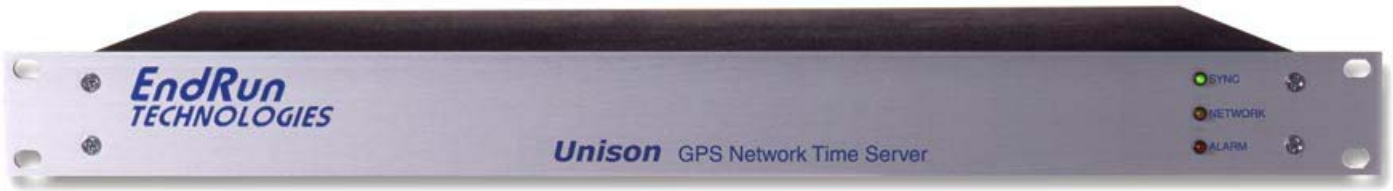


ERC: Maintenance Terminal



ERC: Time Server

- GPS Antenna provides GPS Signal to Time Server
- Provides time source to synchronize all computers in the RWSL system with the ASDE-X system



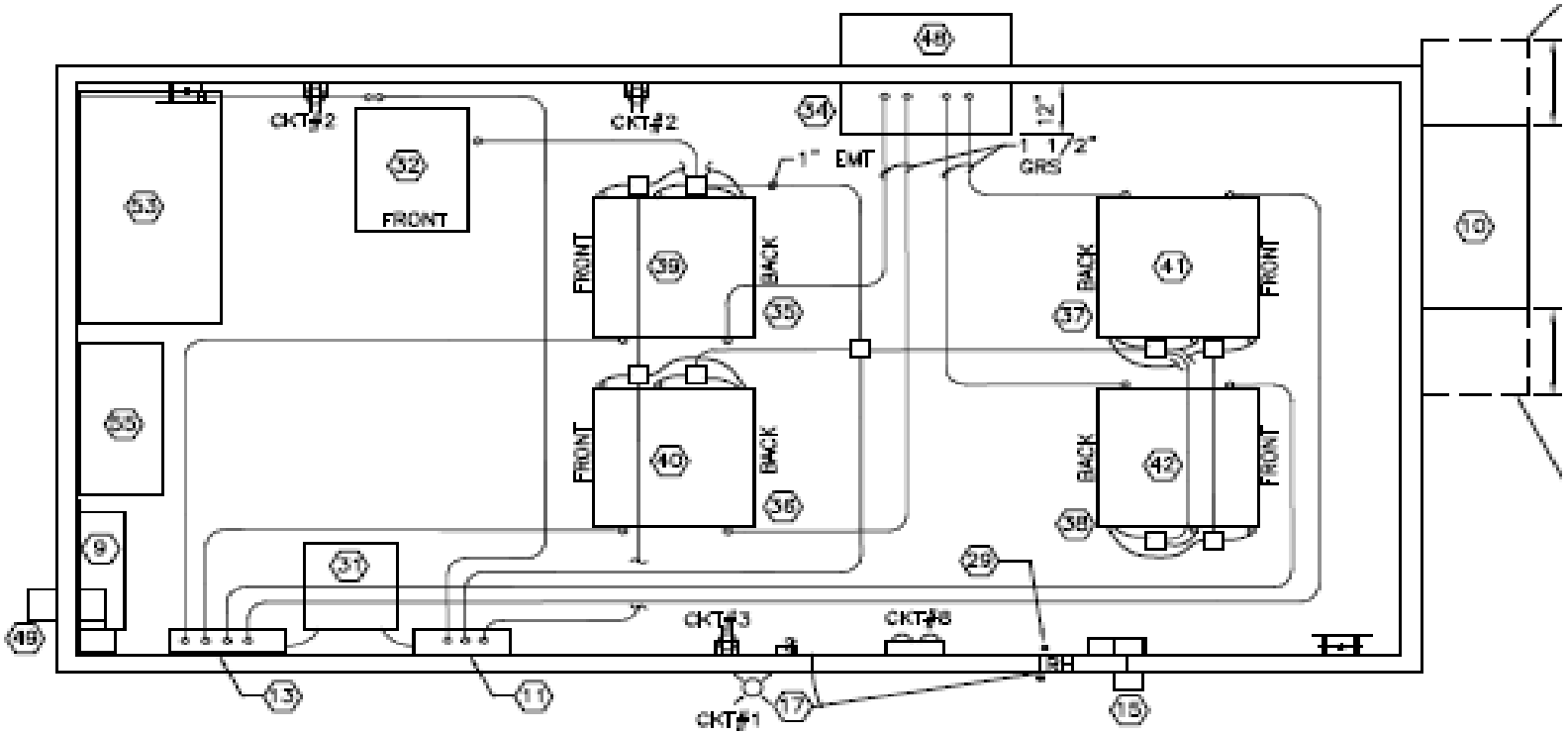
ERC: Com and Support Equipment

- RWSL Router provides 24 Ethernet 10/100/1000 ports
- FLS router provides 8 Ethernet 10/100 ports
- Media Converter used to communicate with FLS
- Fiber Splitter
- Power Conditioner
- Convenience Outlets

Shelter

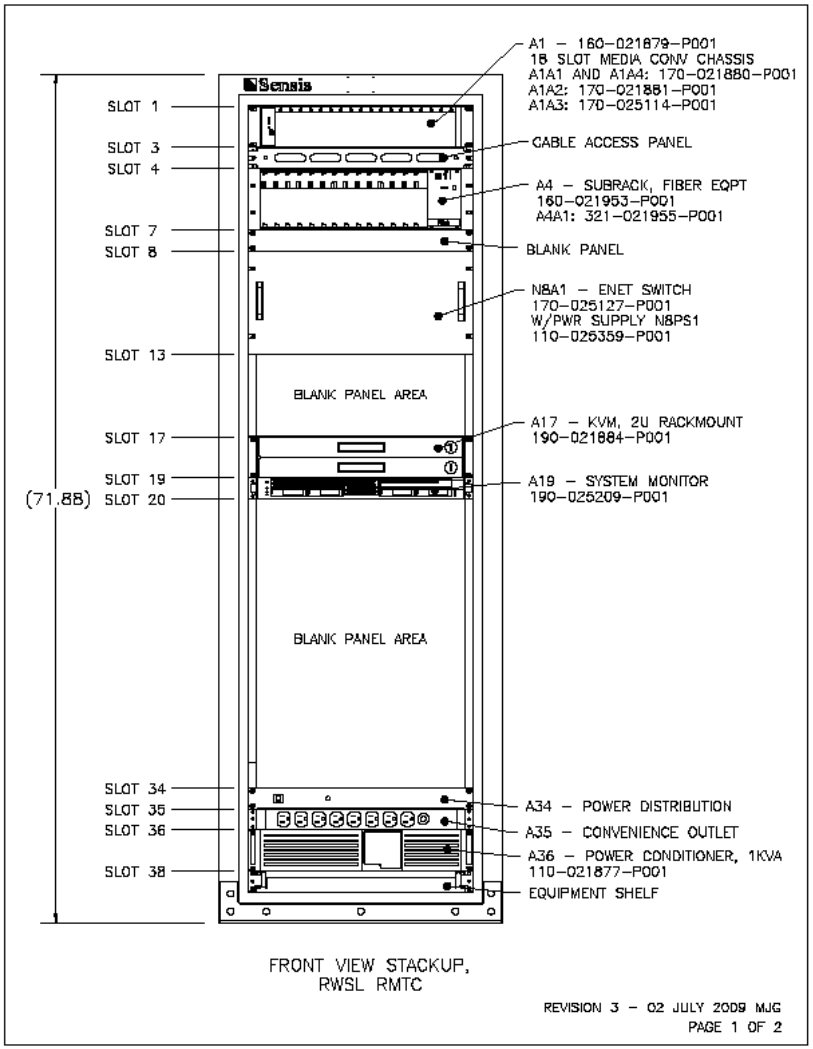
- Up to 8 Shelters per airport
- Size: 12’ x 26’
- HVAC options, fan/vent, power options, plus others.
- 2100, Safety and Work/Egress Clearances

Shelter


48
54
1" EMT
1 1/2" GRS
CKT#2
CKT#2
52
FRONT
53
39
FRONT
BACK
35
41
BACK
FRONT
37
55
40
FRONT
BACK
36
42
BACK
FRONT
38
9
31
29
CKT#3
CKT#8
CKT#1
13
11
17
15
10

Shelter: Remote Maintenance Cabinet

- Remote Maintenance Terminal
- Standard KVM
- Media Converters
- Fiber Equipment
- Power Distribution
- Power Conditioner



Shelter: Constant Current Regulator

- Maintains a constant current level throughout one series circuit loop
- The current level is determined by the light intensity setting
- Includes ACE – Advanced Control Equipment (ACE)
- Up to 4 CCRs per Shelter

Shelter: Master Light Controller (MLC)

- Power line carrier modem
- Receives light commands from the LC and sends communication signals to the individual light controllers
- Provides illuminate/extinguish control capability for the Individual Light Controllers on one circuit
- One MLC per CCR
- Rack mounted above CCR

Shelter: Power and Comms

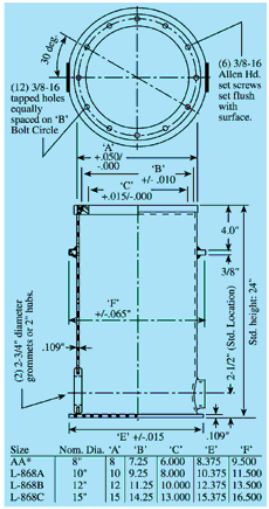
- Power
  - Disconnect Switch
  - 480V Input Panel
  - Utility Transformer
  - Distribution Panel
  - High Voltage Output Cabinet
  - Series Cut-out (SCO) Power output box
- Communications
  - Fiber Demarc - Corning LANscape P/N - WCH-04P
  - Kill Switch Relay
  - Cable Tray

Field: Light Fixtures

- THL fixtures conform to FAA AC 150/5345-46D Type L-850T
- REL fixtures conform to FAA AC 150/5345-46D Type L-852S

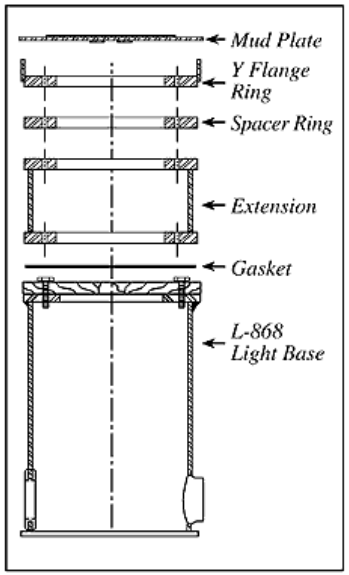
Field: Light Can

- 12” diameter x 24” height
- Type L-868
- Hot-dip galvanized
- 1” drain
- 6 bolts
- Plate installed if fixture unavailable



Size	Nom. Dia.	'A'	'B'	'C'	'E'	'F'
AA*	8"	8	7.25	6.000	8.375	9.500
L-868A	10"	10	9.25	8.000	10.375	11.500
L-868B	12"	12	11.25	10.000	12.375	13.500
L-868C	15"	15	14.25	13.000	15.375	16.500

L-868 Light Base



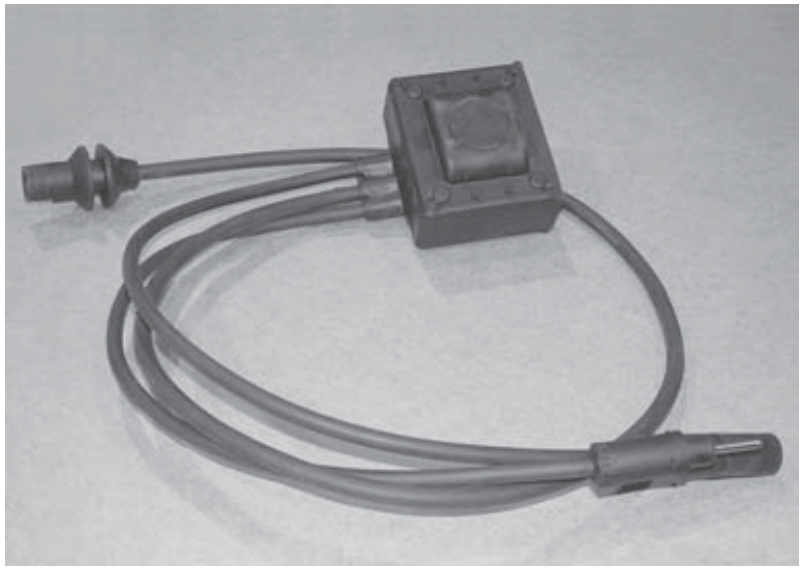
L-868 Installation Configuration

Field: Individual Light Controller (ILC)

- Addressable, Low-Power, RF carrier-current modem located in each light can
- Receives the command signals sent from the MLC over the series circuit
- Illuminates and extinguishes the light fixture accordingly
- Monitors the diagnostics of the light fixture

Field: Isolation Transformer

- Isolates the light fixture from the high voltage primary side of the series circuit



Upgrade Equipment to Production RWSL System

Equipment Locations

- Tower Cab
- Tower Equipment Room
- Airfield Shelter/Vault
- Field

3 Categories

- Remove/Replace prototype equipment
- More information required to determine if replacement is required
- Prototype equipment replaced by production equipment

Tower Cab

- **Remove all prototype equipment**
- **Install**
  - Cab Control Panel
  - Kill Switch

Tower Equipment Room

- **Remove all prototype equipment**
- **Install**
  - RWSL Equipment Room Cabinet (ERC)
- **Assess**
  - Is the existing fiber optic cable to each vault adequate or should it be replaced?

Shelter/Vault

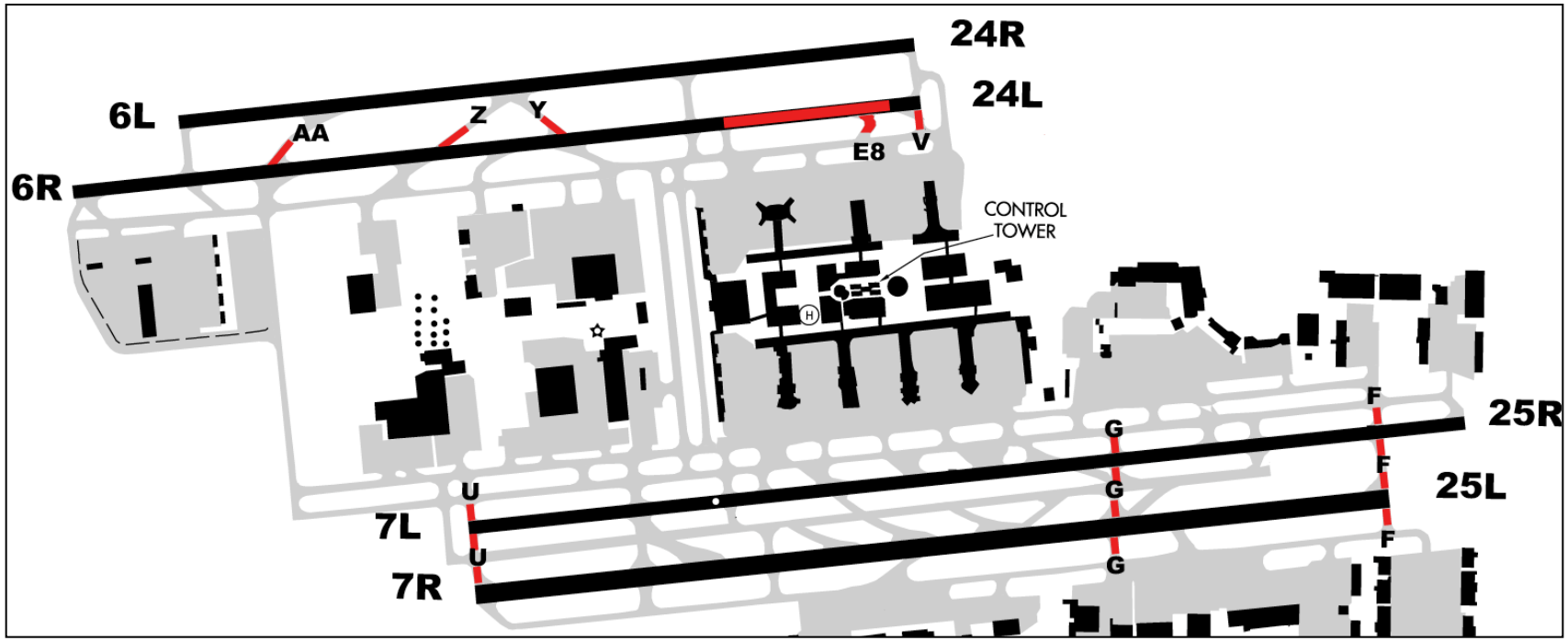
- **Remove all prototype equipment**
- **Install**
  - Remote Equipment Cabinet
  - Constant Current Regulators
  - Master Light Controllers
  - Supporting Electrical Equipment
- **Assess**
  - Should shelters be provided or are vaults adequate?
  - Do light circuits share conduit with any other field lighting equipment?

Field

- **Retain**
  - Light cans
  - As much conduit as possible
- **Replace**
  - Individual Light Controllers
- **Assess**
  - Are transformers adequate?
  - If LEDs are to be used, fixtures and transformers will be replaced.
  - Is grounding adequate?

REL and THL Locations

- **Aeronautical Charts**
  - Are REL and THL Locations required on charts?



Runway Status Lights System

QUESTIONS ?