

# OFFICE OF TRAFFIC & SAFETY



WILLIAMSON COUNTY  
TRAFFIC & SAFETY  
ENGINEER-OFFICE OF THE

NRIT'S  
HEARTLAND  
BRANSON

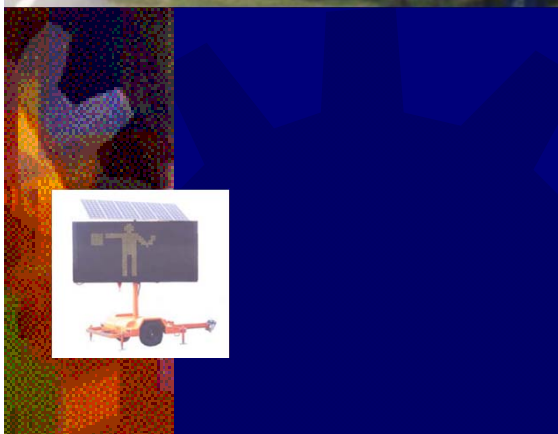
AUGUST  
26  
2014





# iCWS

## ☀ intersection Conflict Warning System





# Needed a “middle” treatment

?







## Some 'Middle of the Road' Options

- ✦ Standard at-grade rural intersection
  - ✦ Roundabouts
  - ✦ J-Turn
  - ✦ Traffic Signals
  - ✦ Off-set connections
  - ✦ Improved geometrics (offset turn lanes, etc)
  - ✦ Signing, Painting and Lighting
  - ✦ Closure of side-road access
  - ✦ iCWS



Full Interchange



iCWS





# It wasn't always called that

- ★ Flashing Safety System
- ★ Advanced LED Warning System for Rural Intersections
  - ★ Aka “Alert”
- ★ RICWS
- ★ D-CS Detection – Controlled System
- ★ “Dyersville” lights
- ★ “Blinky” lights
- ★ \_\_\_\_\_ Lights





# Was not until Dinner on a cold Minnesota night

- ✦ Enterprise Work Group
- ✦ Could not leave the table until we agreed on a name
- ✦ So we ordered another round.....
- ✦ Finally agreed on iCWS
- ✦ Intersection Conflict Warning System



i (Apple Guy since 1984)

Carter  
William  
Sorenson





# iCWS Locations

Spencer

Dyersville

Springville

Anamosa

Iowa

Scotch Ridge Des Moines

Omaha

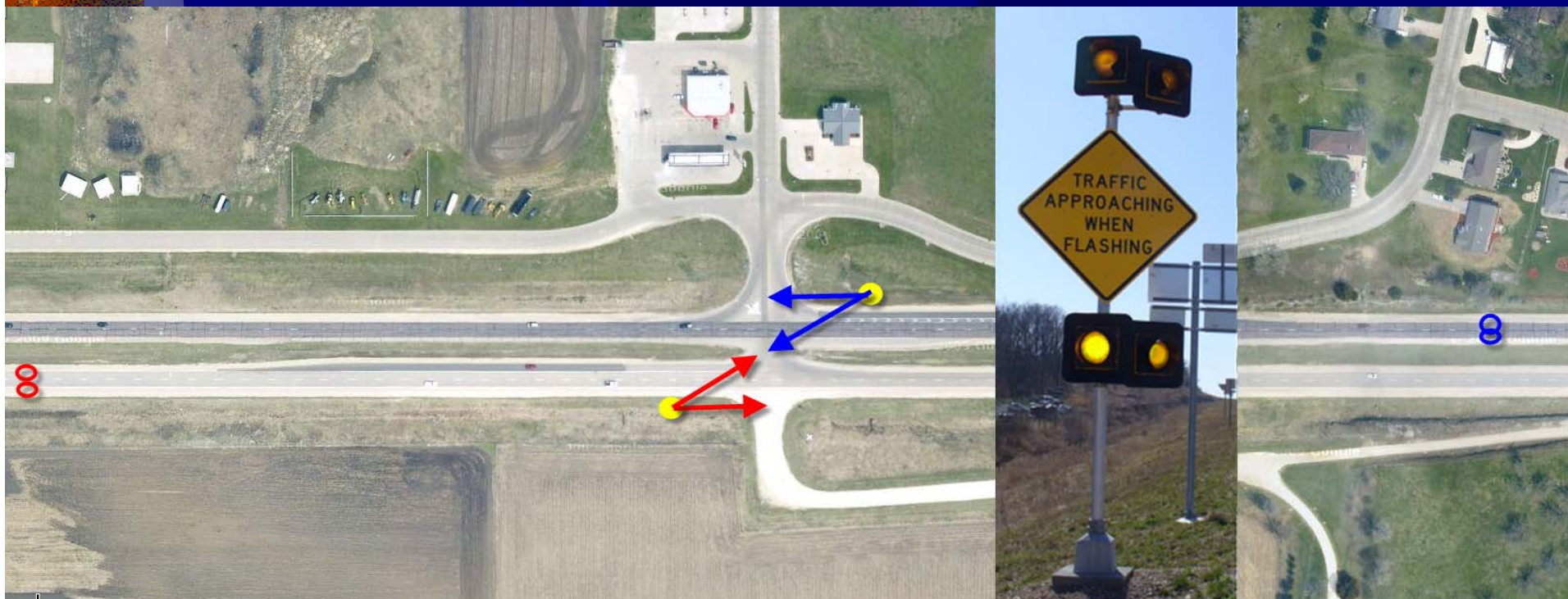
New London

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Image Landsat

Google earth



# How does Iowa (currently) use iCWS?



## Minor Road Warning





# How we got them in Iowa

- ★ Tom Welch, (Former Iowa DOT Safety Engineer) drove through Missouri.
- ★ Saw their system and wanted to try it in Iowa.
- ★ Since we had zero experience with it, we relied 100% on the what they did.
- ★ Advantages and disadvantages doing it this way
- ★ However, it was “Willy-ized” (just a little)



# Iowa's Version



- ★ Kept the main functionality (warn side-road)

- ★ We reviewed their 'lessons learned', and made our own customization:

- ★ Used loops instead of detection pucks
- ★ Did not use a controller, just relays
- ★ Flashes for about 13 to 14 seconds (98<sup>th</sup>%)
- ★ 100% A/C powered
- ★ Battery Backup
- ★ Will be adding light for night viewing
- ★ Camera for monitoring, with 24/7 recording



- ★ Each direction is independent





What Iowa uses.  
(So Far)











# Expressway, At-Grade Intersections Dyersville, Anamosa, Springville and New London







# Video Example at Dyersville



[Click here to get to file](#)

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# Iowa's Results for just Side-Road Warning

<u>Dyersville:</u>		Before		After	
		6.5 years		4 years	
	Fatal/Major	0.8	crash per yr	0	crash per yr
	PDO/Minor	0.8	crash per yr	1.8	crash per yr





# During Iowa's Deployments, The Enterprise Group started looking into these across the US

- ✦ Jon Jackels was the lead state w/ MN
- ✦ Asked his neighbors to the south if we would participate
- ✦ We learned a lot!!





# Other State's Concepts we brought back

- ★ Don't have to limit ourselves to 4-lane expressways
- ★ Other signage options
- ★ Warning based on time not distance
- ★ You can also warn the Mainline traffic







# How Iowa added a Mainline warning

- ★ North Carolina report that showed a better crash reduction when both Mainland & Side-Road had warnings
- ★ Acceptance grew from the field staff and asked to install more
- ★ I left ITS and went to Traffic & Safety





# How Iowa added a Mainline warning

- ★ 1<sup>st</sup> signage we add at problem locations
- ★ Seeing this crash.....





# Interesting Video Clips

★ August 20<sup>th</sup>, 2011 US 330/65/117 – 7:25





# The Mainline driver saved the day!







# Interesting Video Clips

★ December 31, 2011 US 330/65/117- 2:20





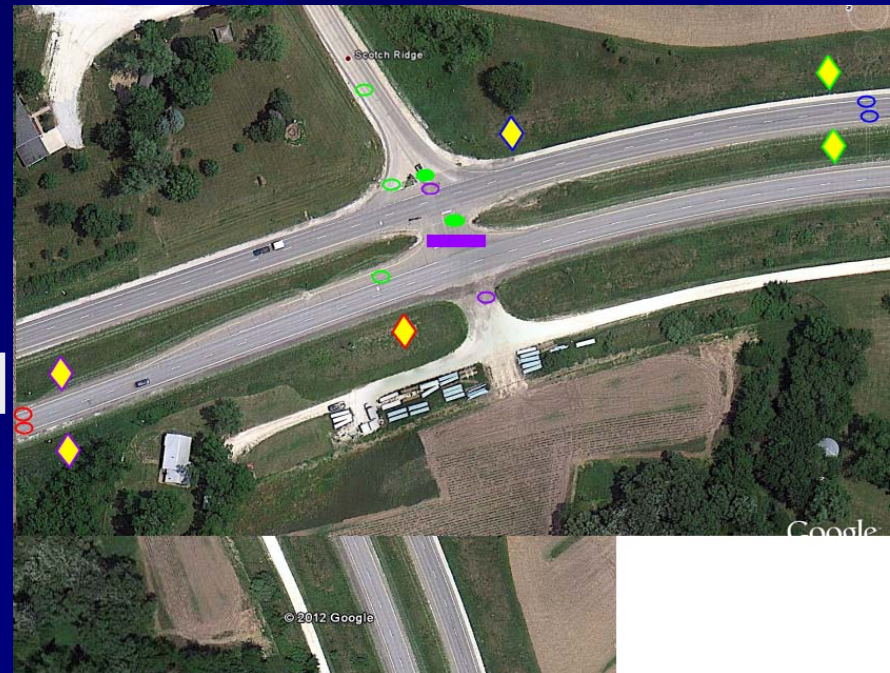
# The Mainline driver saved the day!





# Steps to Add Mainline Warning

- ★ Hire a consultant.
- ★ Iowa DOT has On-Call ITS Consultants
- ★ John Jackels just retired from MnDOT
- ★ He needed the work :0)







- Design and Evaluation Guidance

- Concept of Operations

- System Requirements



AUGUST 2014

ENTERPRISE Transportation Pooled Fund Study TPF-5 (231)

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System Requirements for  
Intersection Conflict Warning  
Systems (ICWS)

FINAL REPORT

Prepared by:



Design and Evaluation Guidance  
for Intersection Conflict Warning  
Systems (ICWS)

Prepared with support from:

USDOT FHWA Office of Safety  
[www.safety.fhwa.dot.gov](http://www.safety.fhwa.dot.gov)

Prepared by:



Version 1: December 2011





# System Engineering/Con Ops

- ✦ What is the problem?
  - ✦ Running a Stop Sign?
    - ✦ Or
  - ✦ Failure to Yield?
  - ✦ There is a difference, but many times the crash report is not filled out correctly
  - ✦ You do not know what the problem until you have video
  - ✦ Nationally, (and Iowa), drivers STOP, but pull out in front of an oncoming car





# Stakeholder Meeting





# Our Stakeholder Meeting







# Stakeholder Meeting w/ Field Staff

- ★ You have the one on maybe only chance to get input from field staff
- ★ KISS Principal
- ★ Could lose them
- ★ Could get awesome insight of operational problems
- ★ Example what not to do



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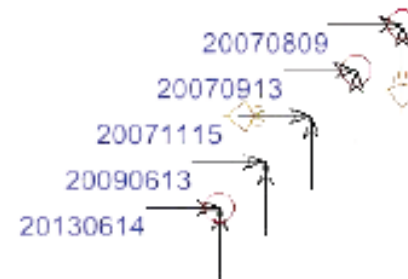
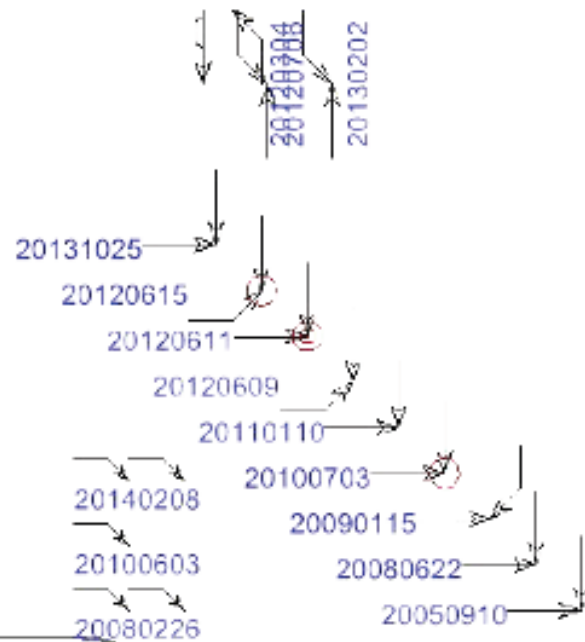
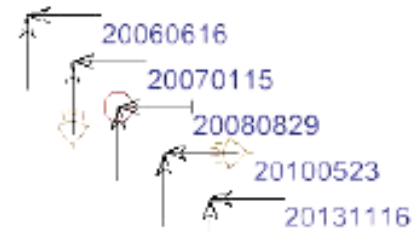
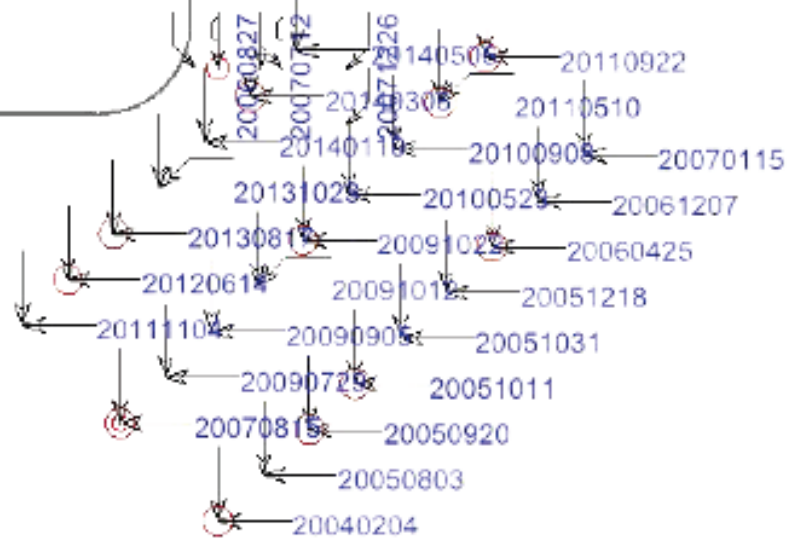


ID #	Needs	ID #	High Level Requirements	ID #	Detailed System Requirements
1	Major road drivers approaching an intersection equipped with ICWS need an alert to indicate when vehicles are approaching, at stop signs or at yield signs on the minor road.	1.1	ICWS shall detect all vehicles approaching and waiting at the stop or yield signs on the minor road.	1.1.1	ICWS shall detect vehicles from both directions on the minor road as they are a. approaching the intersection less than time $t$ and b. as they are waiting at the stop sign or yield sign on the minor road.
<p><b>Considerations:</b> Time <math>t</math> is a single constant for the intersection and is the largest time computed based on the major road vehicle lag time from 2.5 seconds in advance of the major road warning sign to the intersection at the posted speed limit. Distances are based on the typical condition for deceleration to the listed advisory speed for the warning of a potential stop situation as defined in <a href="#">MUTCD Table 2C-4</a>. The distances are based on the 2005 AASHTO Policy, Exhibit 3-1, Stopping Sight Distance, providing a PRT (Perception-Response Time) of 2.5 seconds, a deceleration rate of 11.2 feet/second, minus the sight visibility distance of 180 feet. The distances shown in Table 2C-4 are provided as an aid for determining sign location and can be adjusted for roadway features, other signing or alert conditions and to improve visibility. Time <math>t</math> is applied to the minor road as a range for detecting vehicles that will activate the major road alert. An illustration of how time <math>t</math> may be applied is provided in Appendix A for ICWS 3 and ICWS 4. Yield sign location is included in this requirement to accommodate deployments on median-divided roadways.</p>					
				1.1.2	ICWS shall respond with at least XX% accuracy when vehicles are on the minor road.
<p><b>Considerations:</b> This requirement encompasses all ICWS components and presumes they will all function to allow successful activation of the alert for approaching vehicles with an accuracy threshold defined by the transportation agency. When selecting the specific accuracy threshold, it is important to consider both safety and credibility factors. From a safety perspective, the ICWS should have a degree of accuracy that does not create a hazard. Similarly, the accuracy of the system should be such that drivers view the alert as credible. This value should be established using engineering judgment and consideration of how the value translates into vehicles that could be missed by the system. As a reference point, a minor road with an ADT of 2,000 and an ICWS accuracy of 99.95% results in one error per day for the major road alert. A 95% accuracy threshold could result in as many as 100 errors per day for the major road alert.</p>					
		1.2	ICWS shall display alerts to major road drivers whenever a vehicle is approaching or waiting at a stop or	1.2.1	ICWS alert shall be active on the major road whenever any vehicle on the minor road is a. approaching less than time $t$

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Spencer







# Some of the more interesting Discussion Items

- ☀ Red Flashing Beacon
  - Keep or Remove?
- ☀ Do we have “Running Stop Sign” or “Failure to Yield” problem?
- ☀ Will adding 8 flashing amber beacons
- ☀ Agreed to remove and monitor with Camera.





# Detection Accuracy

- ✱ Do you want 98% accuracy?
- ✱ or
- ✱ Do you want 99.99% accuracy?
- ✱ Rephrase that question....
- ✱ Do you want to miss 400 cars/day?
- ✱ Do you want to miss 2 cars/day?
- ✱ Engineering test for everyone.....
- ✱ Depends on cost!
  - ✱ \$5,000 extra OK
  - ✱ \$50,000 may not need it



# Test Vehicle





# OFFICE OF TRAFFIC & SAFETY What should the signing be?





Option:

**For Mainline Drivers**

02 **TRAFFIC ENTERING (WHEN FLASHING)** (WX-U1 or WX-U2) sign or a  
**WATCH FOR ENTERING TRAFFIC** (WX-V1 or WX-V2) sign (see Figure 2C-X) or  
similar message may be used on the through roadway approach to a side road stop  
controlled intersection as part of an Intersection Conflict Warning System to warn of  
entering traffic from the side road.

*The sign may be in diamond or rectangular format. (note: place holder for illustration)*

**For Side-Road Drivers**

03 The **TRAFFIC APPROACHING (WHEN FLASHING)** (WX-Y1 OR WX-Y2) sign or  
the **WATCH FOR APPROACHING VEHICLES** (WX-Z) sign or similar message (see  
Figure 2C-X) may be used on the side road stop controlled approach of an Intersection  
Conflict Warning System to warn of approaching traffic on the through road.

**For Mainline Drivers**

**For Side-Road Drivers**

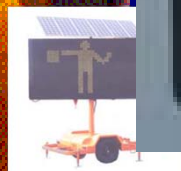




# What happens during failure?



VS.





# Warning time

- ★ Based on Distance

- or

- ★ Based on Time

Distance: “Dumb”  
however, Simple

Always 13 seconds



Time: “Smart” however,  
complex



Flashing time based on speed



# Now the System Engineering is done for all future projects (If we like the results)

- ✦ Next steps
- ✦ Requirements Document
- ✦ Plan Set (basics)







# Construction time next year

- ★ On-Call Electrical Contractor
- ★ Baker Electric
- ★ Same ones that will maintain it
- ★ Minimal Plans needed





## In Closing.....

- ✦ Good Planning
- ✦ Good Consultants
- ✦ Good Contractors
- + -----
- ✦ Great Relationships
- ✦ Which equals
- ✦ Excellent Projects!!!!



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# iCWS / ALS Golfers











**13th Hole only**

<b>Lost:</b>	<b>1</b>	<b>1</b>
<b>Found:</b>	<b>31</b>	<b>25</b>

**06/09/201**

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**Net: A GREAT Hole !!!!!**



# Questions???

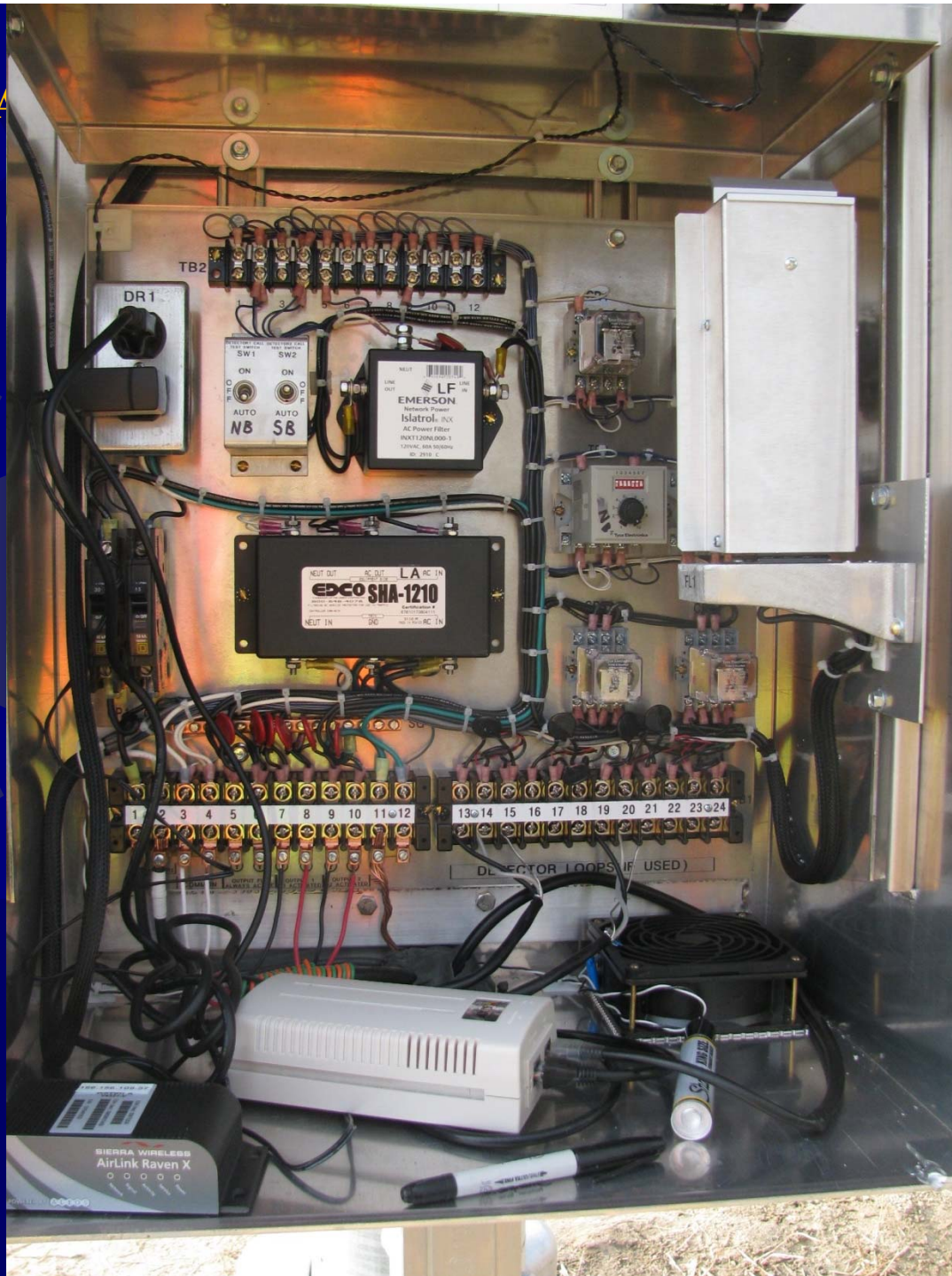








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# Battery Backup

