Cellular DR Overview

Elliott Mills & Yash Patel

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Speaker Introductions

Elliott Mills, Lead Engineer Demand Response

Yash Patel, Lead Engineer Demand Response

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Why Demand Response (DR)?

Reduce power supply costs	Reduce Transmission and Distribution costs	Frequency and Voltage support	Risk Management
• Turn customer loads off during monthly billing peaks (co-ops and munis) • Avoid building/buying generation capacity (IOUs and G&Ts)	• Controlling peak demands may also reduce a utility's transmission costs • Delaying construction costs for a few years can pay for the project	• Line Under Frequency (LUF) & Line Under Voltage (LUV) • Dispatch control	• It can be less expensive to turn off the load than to serve it • Increased PV and EV penetration will create more DR opportunity

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DR Customer Load Examples:

Residential

- AC (air conditioning)
- Water Heating
- Space Heating
- ETS (electric thermal storage)
- Dual Fuel

Agricultural

- Irrigation
- Grain Drying

Commercial and Industrial

- Customer Owned Generation
- Curtailable/Interruptible Loads
- Crypto mining farms

And more….

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DR Building Blocks

Controller (DRMS)

Yukon DR

Communications

Many choices;
some one-way
some two-way
Cellular Cat-M1

Switches

LCRs options for:
Comms
# of Relays
Voltage
Form Factors

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DR Communications Options

One-Way

Ripple (really old)
PLC (old but still used)
FM Side Band (Dead)
VHF (EOL soon, still big)
900 MHz paging (EOL soon, still big)

Two-Way

1. ZigBee (limited 2-Way)
2. RFN (902-928 MHz)
3. Itron (SSN) mesh
4. **Cellular Cat-M1**
   - **Optional Wi-Fi**

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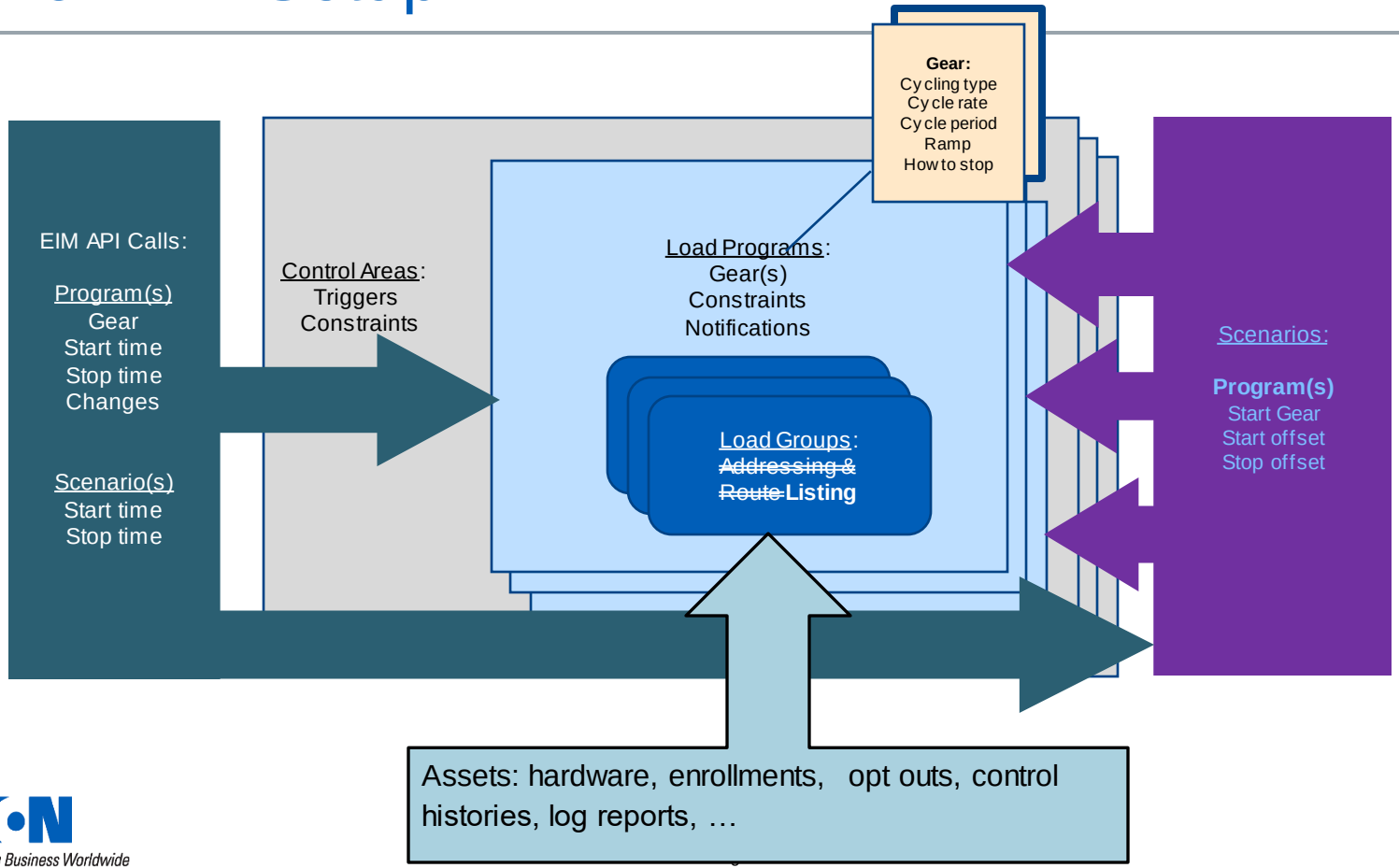
Yukon DR Setup



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What's Different about Cellular (Load Groups)?

- Load Groups = List of Switches
  - No ExpressCom Addressing
  - Route indicated in the Load Group type
- Load Group Parameters:
  - Specify Relay Number
- Old Priority moved to Criticality at the Load Program level
  - If you ask a relay to do two different things, which is more important? Which do you really want it to do?

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Eaton DR Switch Menu

Comms	Old Big Box (up to 3 relays)	Small Box (one 5 amp relay)	New Big Box (up to 3 or 4 relays)	Retrofit Board (up to 3 relays)	Disconnect Meter
PLC	LCR3000 LCR3100 LCR3102				
VHF	LCR4500	LCR4700	LCR4600	LCR4601	
900 MHZ Paging	LCR5000	LCR5200	LCR5600	LCR5001 LCR5601	
RFN		LCR6200RFN	LCR6600RFN LCR6700RFN	LCR6701RFN	
Itron SSN		LCR6200S LCR6201S	LCR6600S	LCR6601S	
ZigBee		LCR6200Z	Big Box LCR6200Z	LCR6201Z	
Cellular Cat-M1 w/ Opt Wi-Fi		LCR6200C **LCR7200C** **LCR7201C board only**	LCR6600C **LCR7600C/w**	**LCR7601C/W**	

EOL 2024

One-way

Two-way

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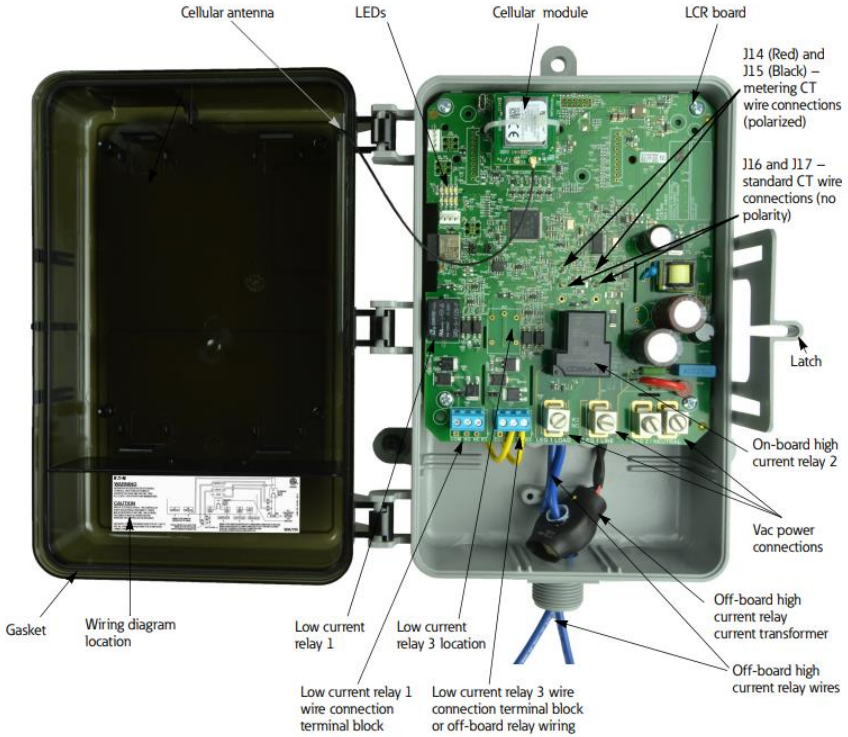
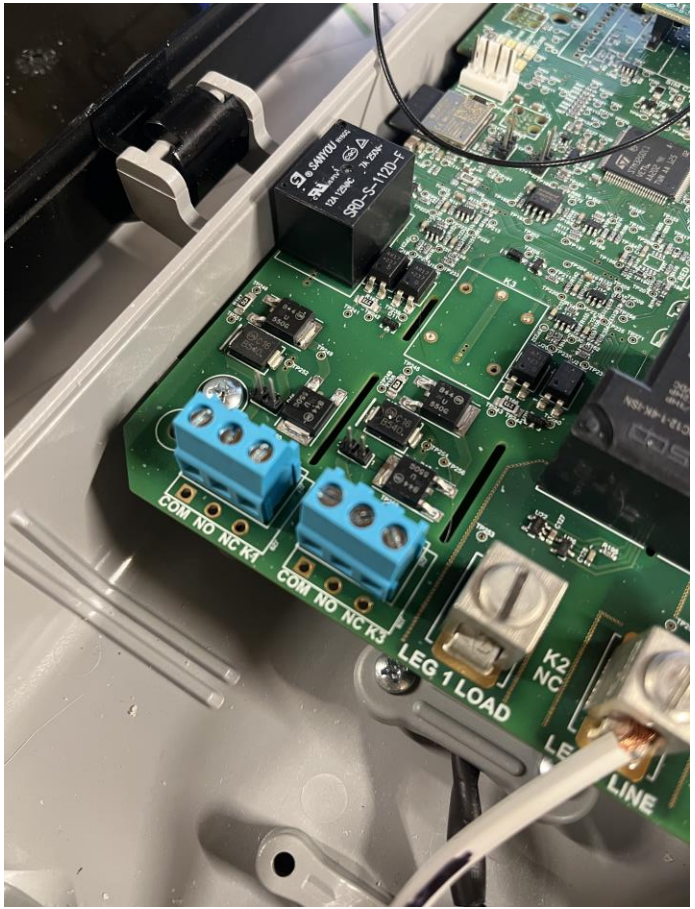
LCR7600 / LCR7601

Figure 1. LCR 7600 switch with cellular radio (1 low current relay, 1 on-board high current relay, 1 off-board high current relay)





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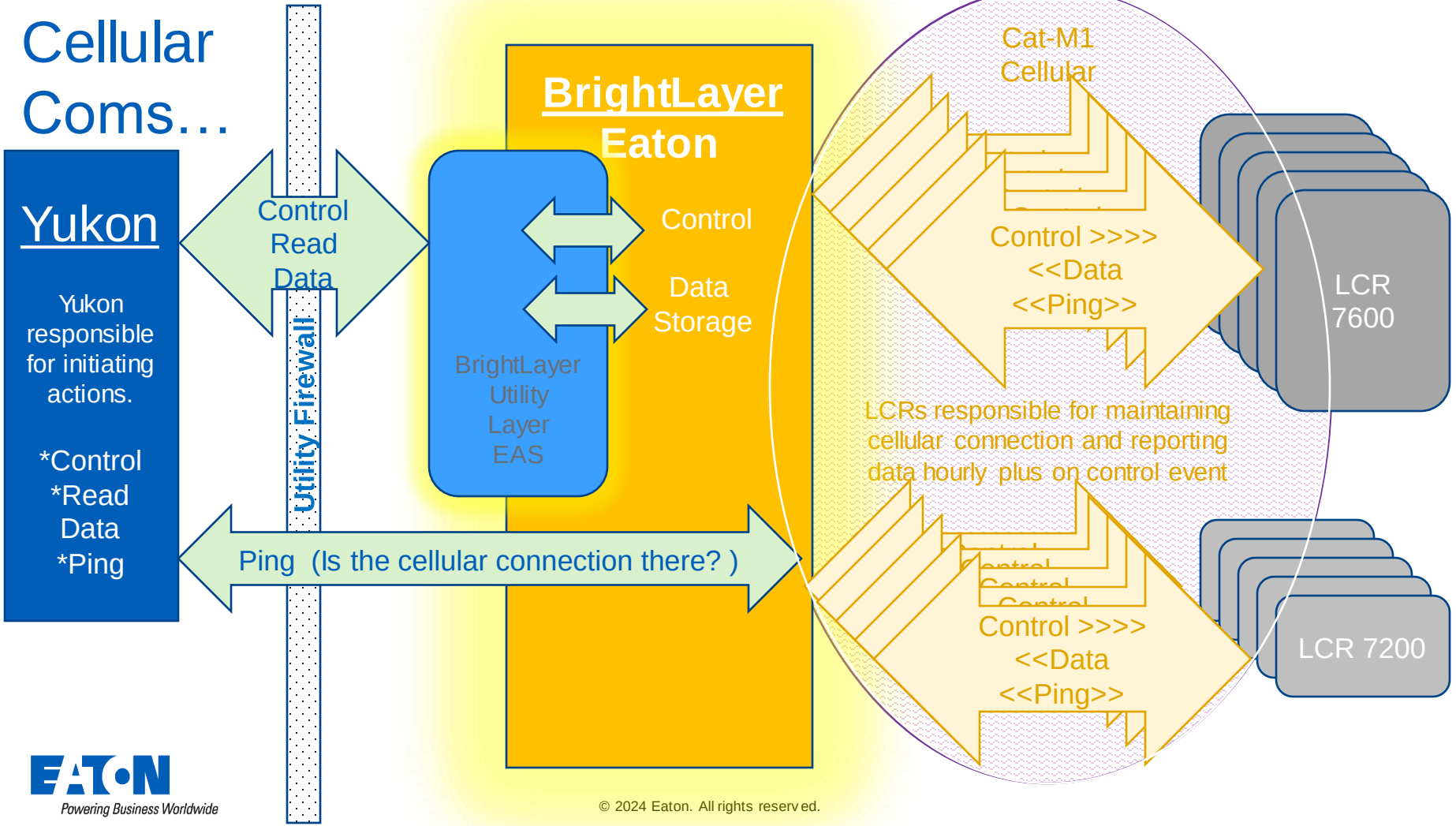
Cellular Coms…



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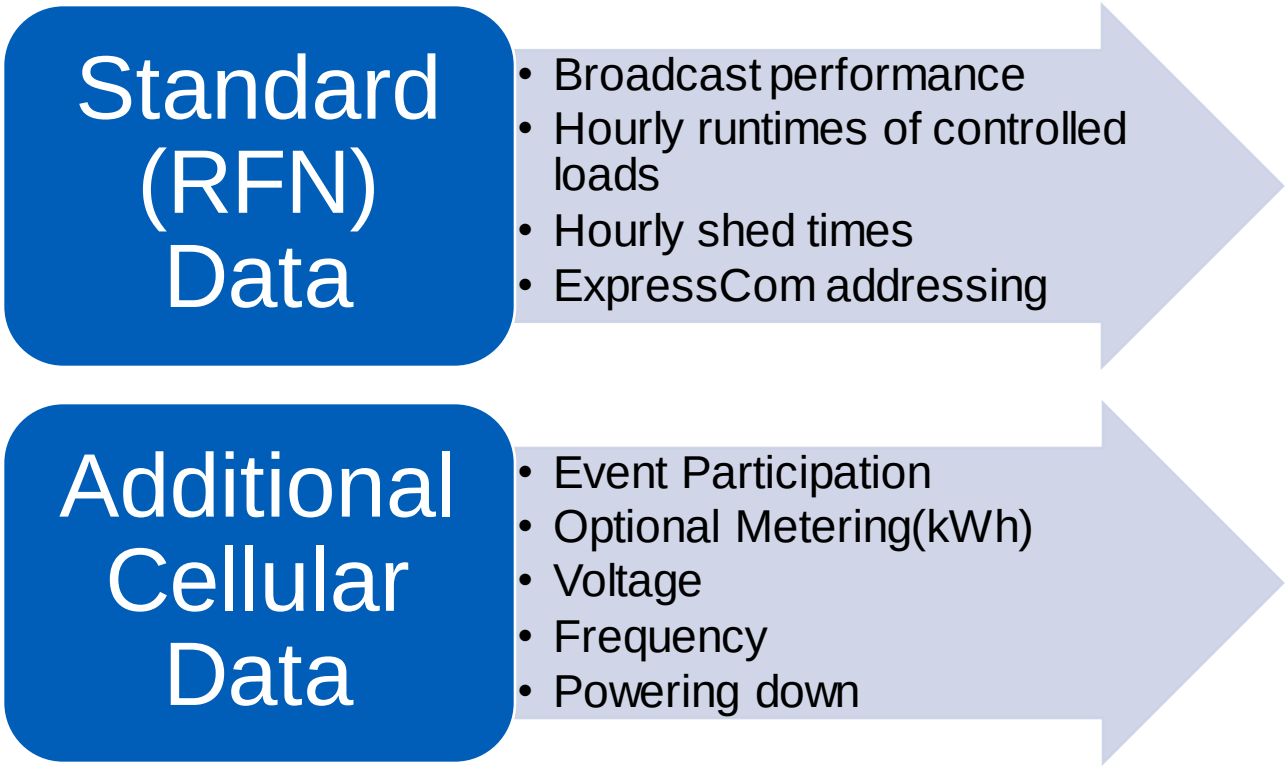
Two Way Data



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Checking Cellular programs

How can we check if it is working?

- Groups of switches
  - Asset Availability / Cellular Coms Data Collection Widget
  - Event Participation Summary
  - Control Audit Report (time sensitive)
- Individual switches
  - Ping
  - Runtime & Shed time
  - Enrollment

What do we do if it is not working?

- It depends on what isn't working

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Troubleshooting Tools - Software

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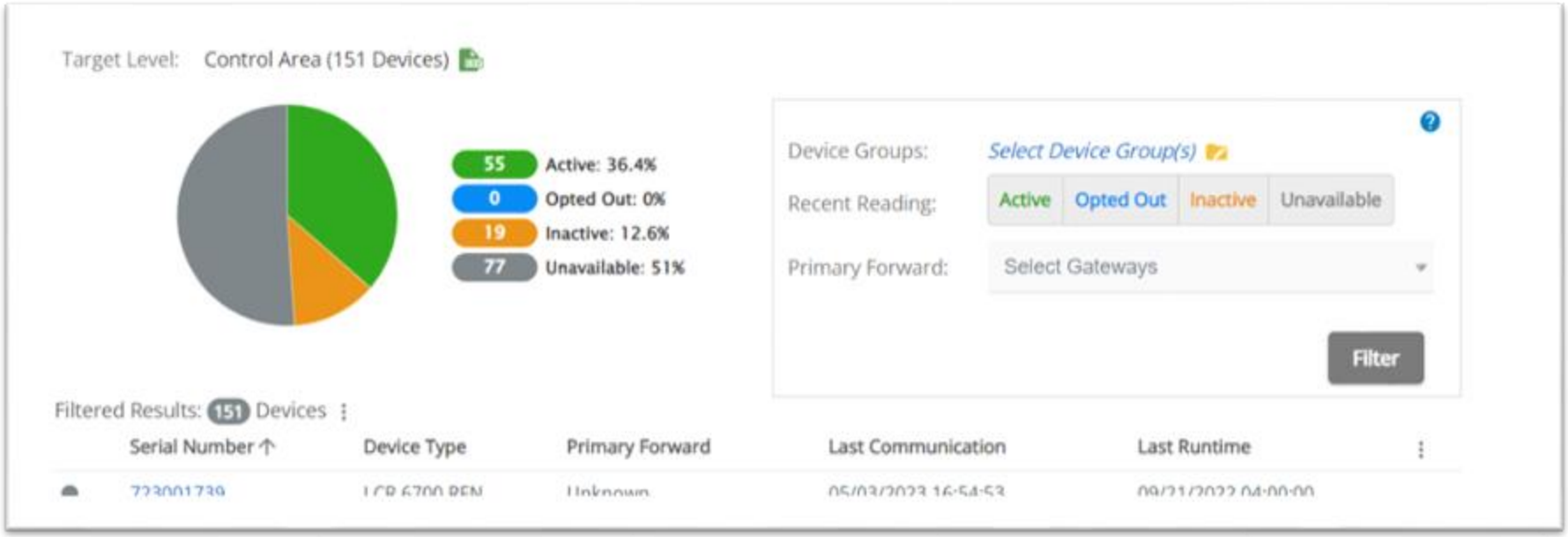
Asset Availability (Before the Event)



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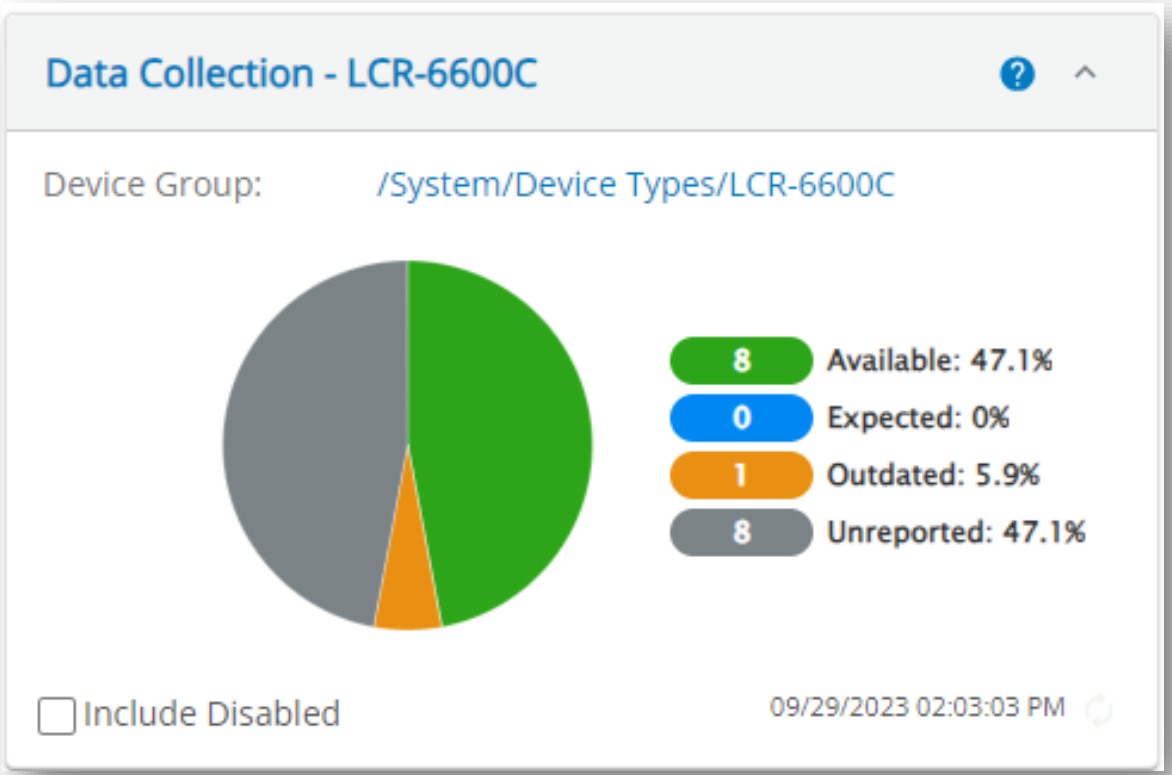
Cellular Data Collection Widget



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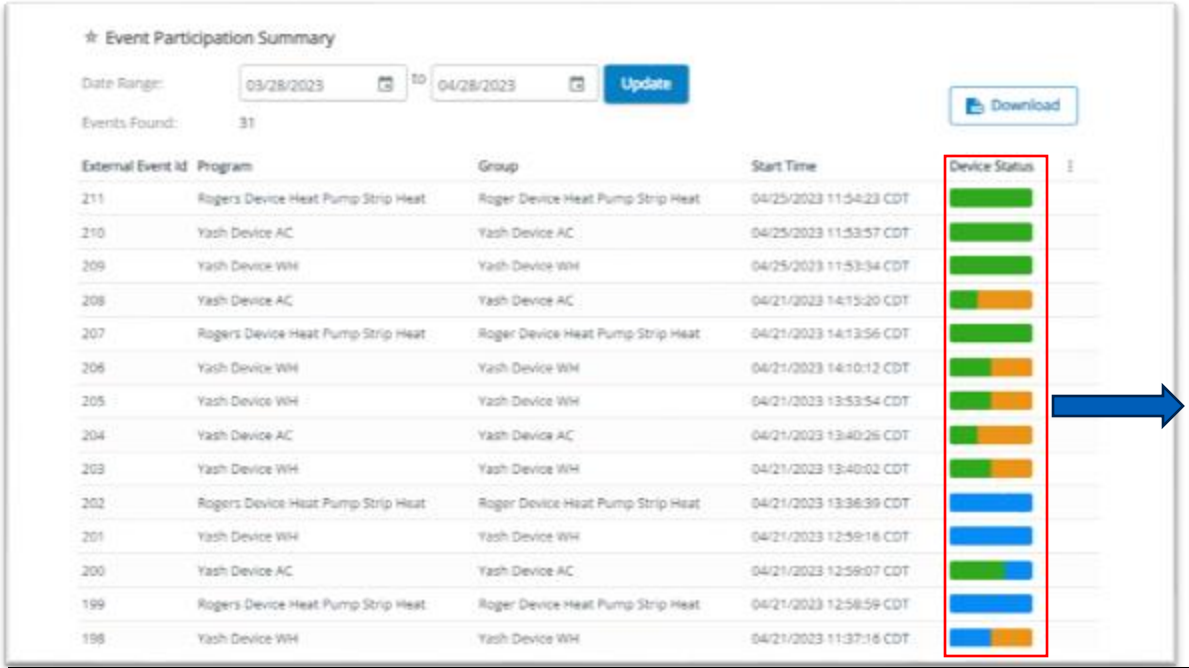
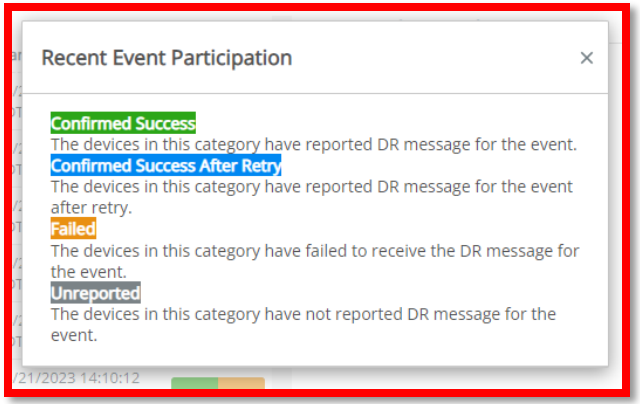
Event Participation Summary (During the Event)





External Event Id	Program	Group	Start Time	Stop Time	Device Name	Account Number	Event Phase	Participation State	Serial Number	OptOut Status	Fail Reason	Retry Time
189	Yash Device AC	Yash Device AC	4/20/2023 7:52	4/20/2023 8:59	7.8331E+13	Yash's Test Devices	Unknown	Unreported	7.8331E+13	NONE	Unable to send device command., id=5534b7eb-9e7b-4700-b637-d3caa8df7832	
189	Yash Device AC	Yash Device AC	4/20/2023 7:52	4/20/2023 8:59	7.1789E+14	Yash's Test Devices	Completed	Confirmed	7.1789E+14	NONE		

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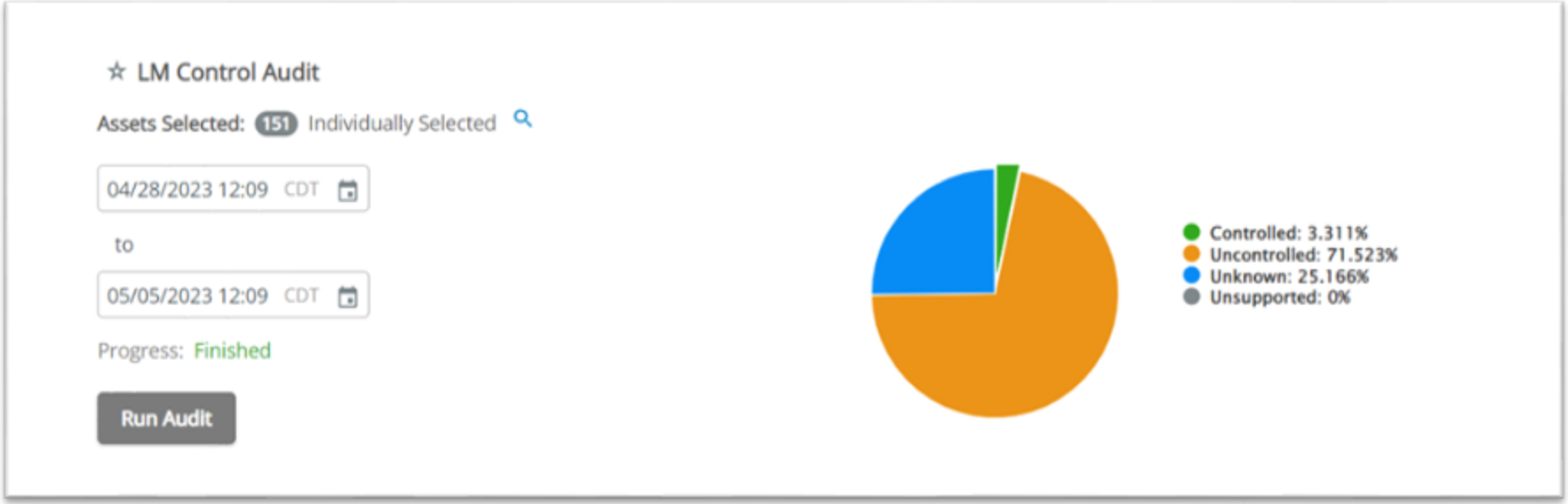
Control Audit Report (After the Event)



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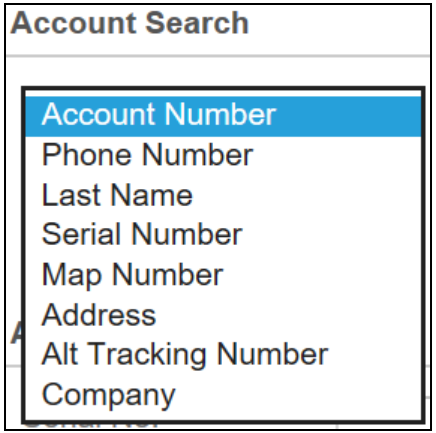
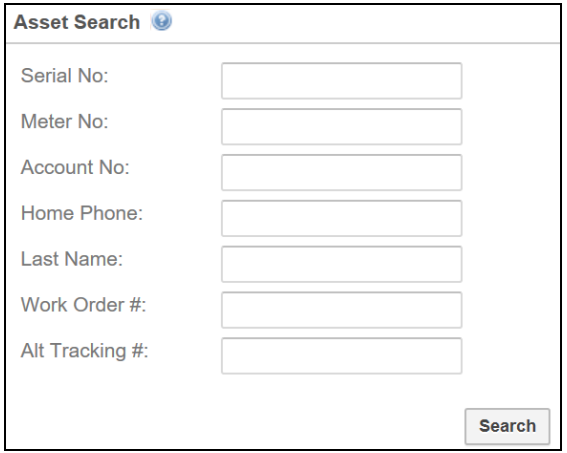
Accessing Individual LCRs

- Search for an LCR Serial Number, using the Assets Dashboard
- Can also search by Account Number, Street Address, Name (if used in setting up Accounts)





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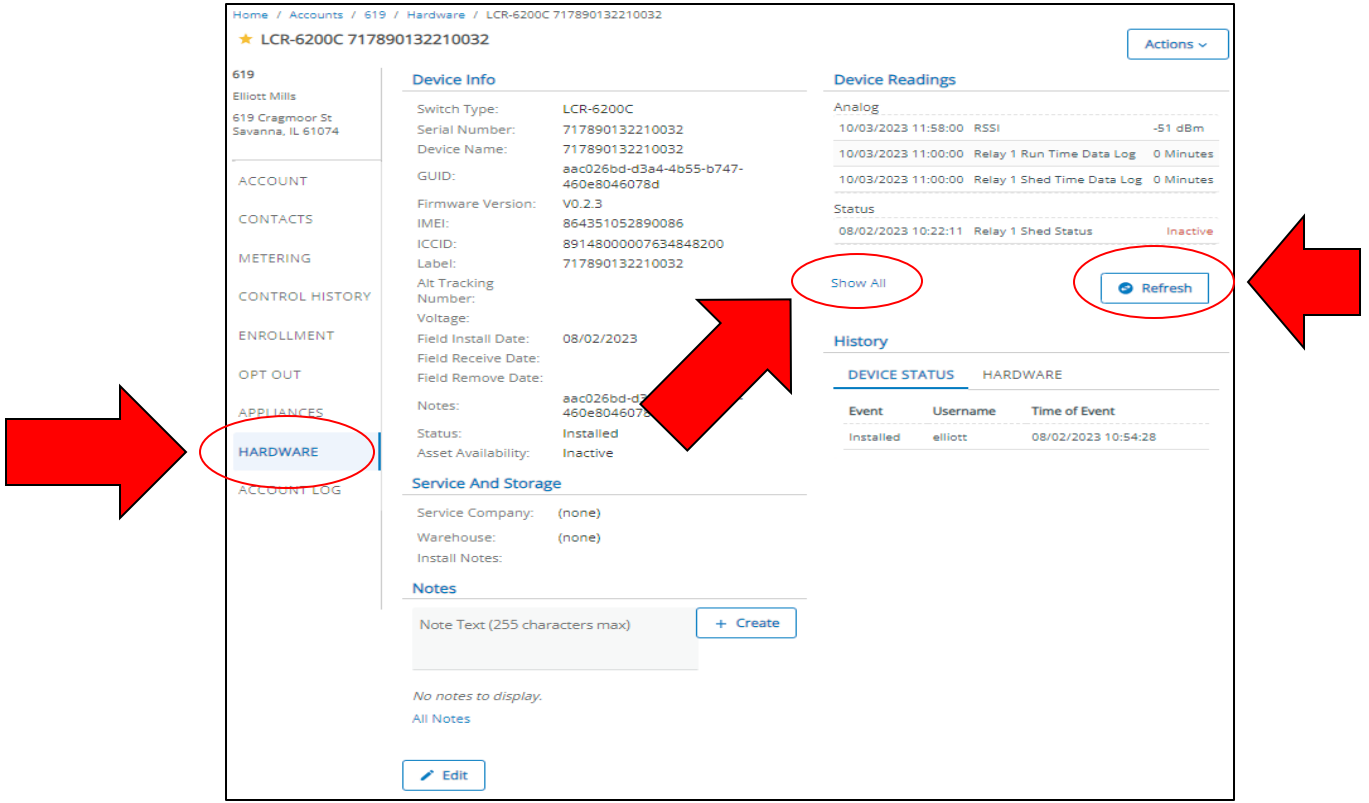
LCR Point Guide



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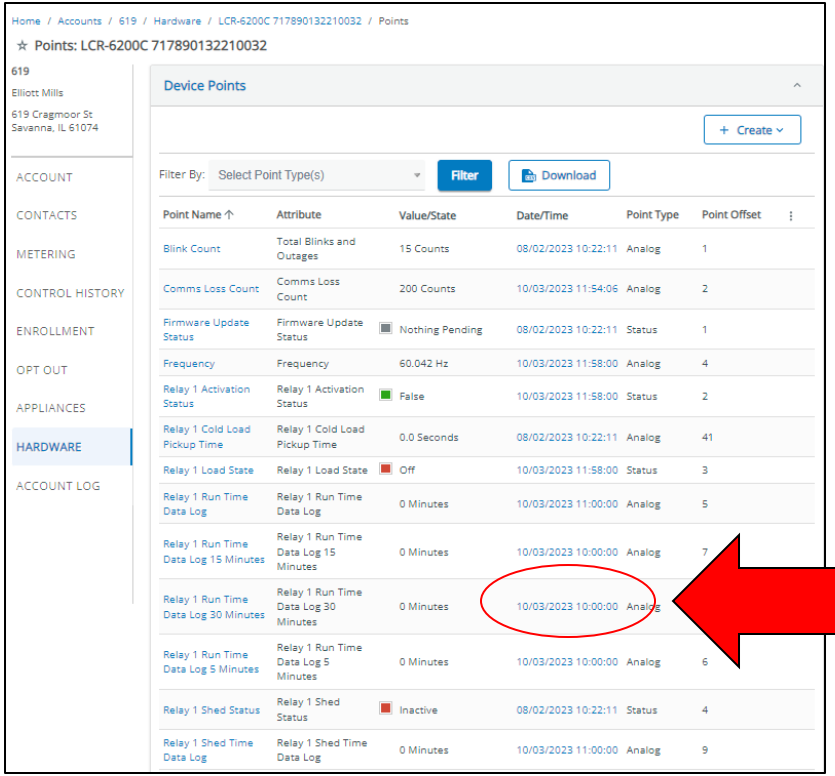
LCR Point Guide Cont.



Any Timestamp can be clicked to get all archived values for that Point

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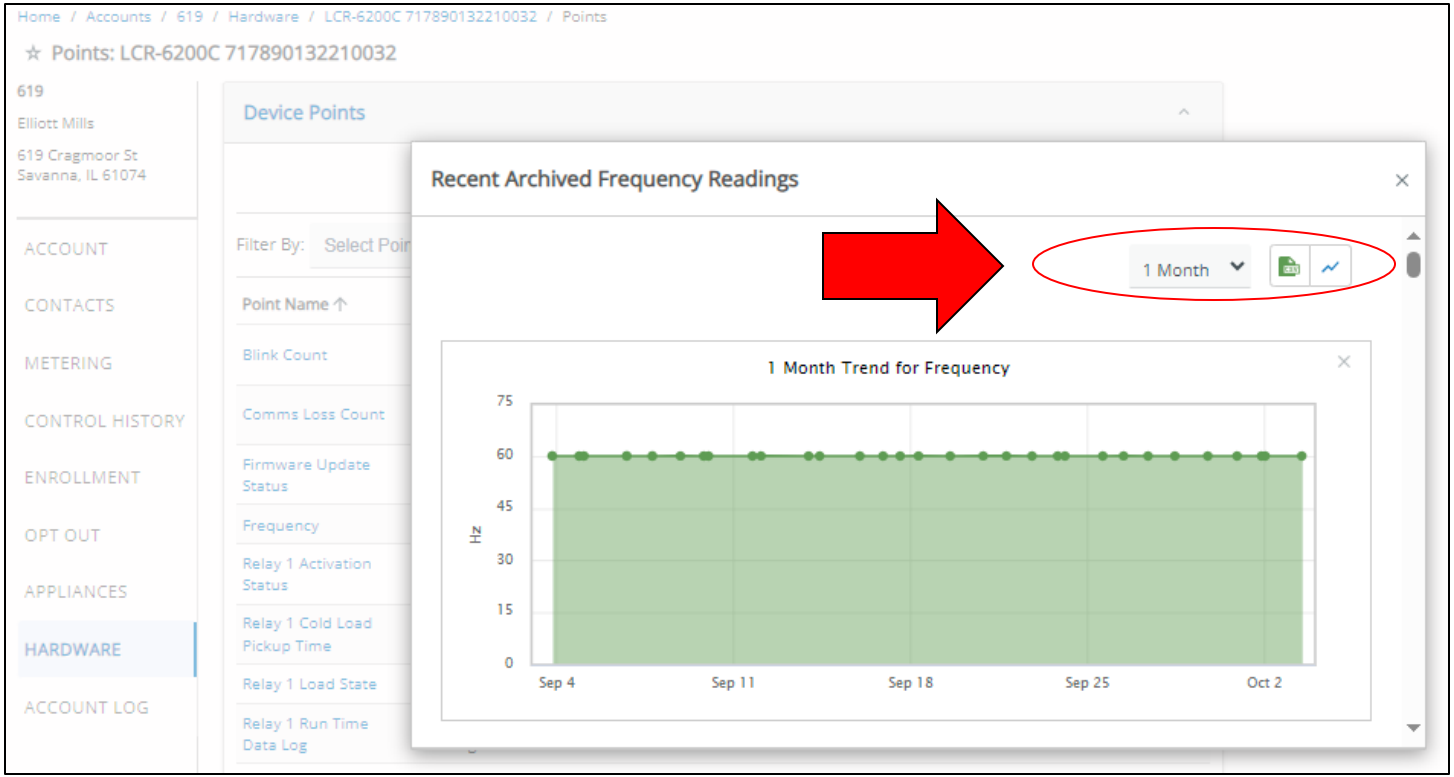
LCR Point Guide - Trending



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Troubleshooting Tools - Hardware

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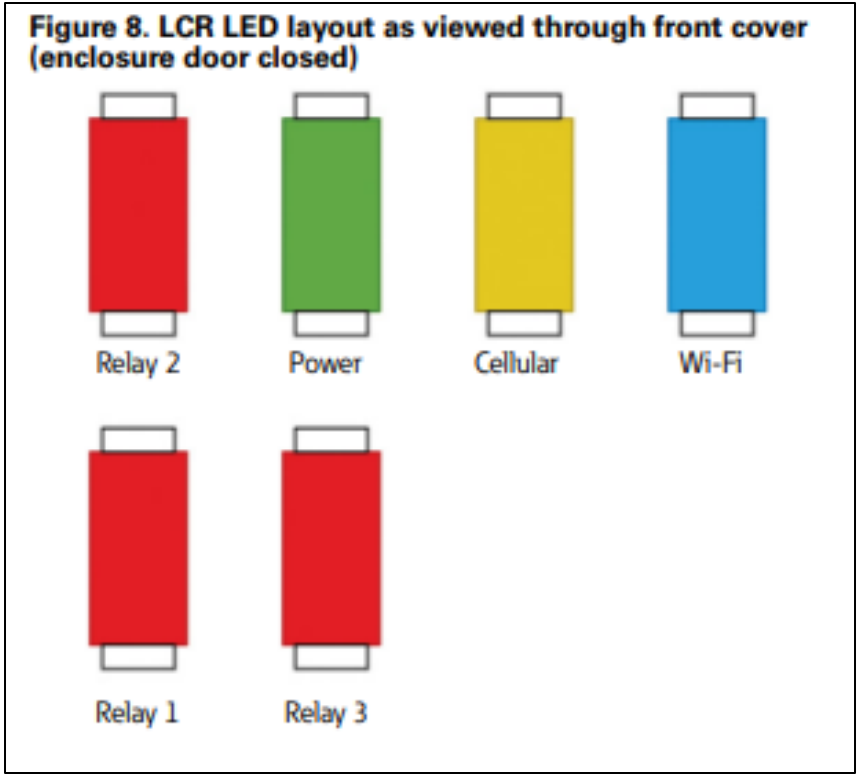
LCR 7600 LED's

- Green: Power light
- Red light on, load off
- Yellow: Cellular Status
  - Slow blink (1 sec)
    - connecting to cellular
  - Fast blink (1/2 sec)
    - connecting to BrightLayer
  - Solid On -- Connected
- Blue: Wi-Fi status



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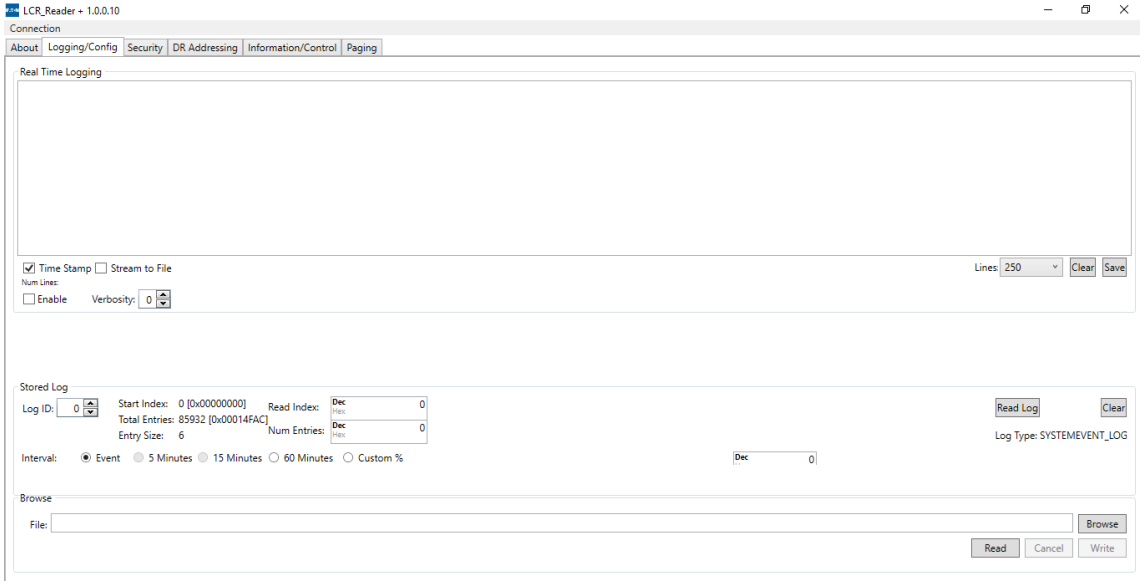
LCR_Reader?

- Switch troubleshooting
- Different Logs
  - Log 0: Event Log
  - Log 1 and Log 2



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Network Runner?

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Questions?

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