THE ROAD LESS SURREPTITIOUSLY TRAVELED

@pukingmonkey

DEF CON 21

THE LOSS OF LOCATIONAL PRIVACY WHILE TRAVELING IN YOUR AUTOMOBILE

- Automatic License Plate Readers (ALPRs)
- Snitch devices in your car
  - Transponder based Electronic Toll Collection (ETC)
  - GPS
  - Smart phones traffic apps
  - Dumb phones
  - Automatic tire pressure monitors

DO YOU HAVE THE RIGHT TO TRAVEL?

Interstate: YES. Saenz v. Roe (1999) the right to travel that is guaranteed by the Privileges or Immunities Clause of the Fourteenth Amendment.

Intrastate: YES. But not as clear, it's usually derived from First Amendment freedom of association and Fifth Amendment due process protection.

International: YES. Kent v. Dulles (1958) The right to travel is a part of the "liberty" of which a citizen cannot be deprived without due process of law under the Fifth Amendment.

DO YOU HAVE THE RIGHT TO DRIVE?

NO

It is a privilege, not a right, that is regulated, must be granted (licensed) and can be revoked, according to the prevailing laws of every jurisdiction of the United States.

DO YOU HAVE THE RIGHT TO ANONYMOUS TRAVEL?

Mostly YES but it depends on your mode of travel, in the U.S. you are not required to carry ID except:

- **when driving, it requires licensing** **NO**
- **taking a commercial flight** **NO**
- **crossing a national border** **NO**

AUTOMATIC LICENSE PLATE READERS

A system of cameras, computers and GPS that reads the license plates (OCR), and notes coordinates and time, they can be mobile or fixed locations.

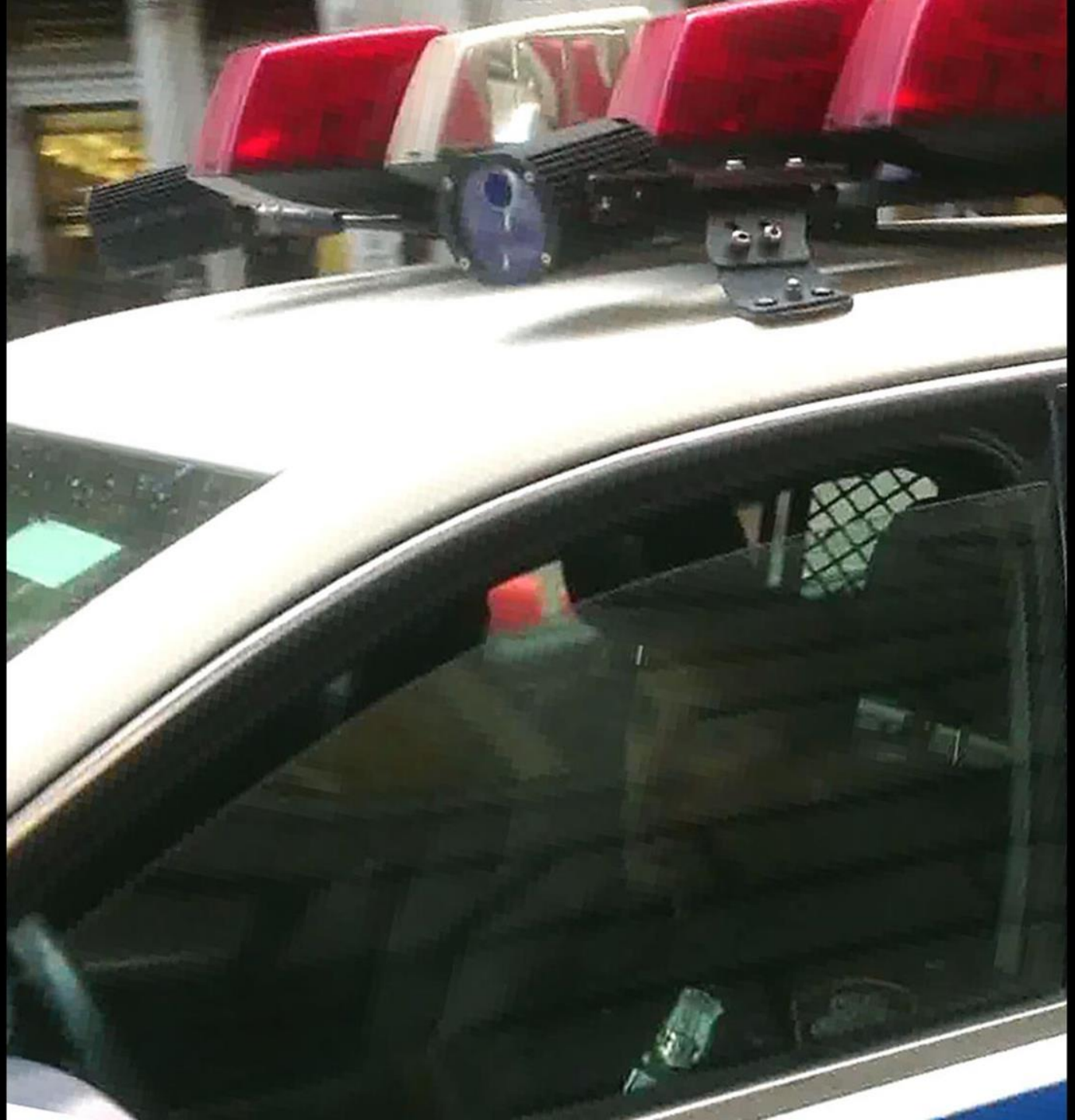
Can do about 3,000 plates/hour, on moving vehicles up to 130MPH.

All data is saved and downloaded to a central repository.

Some ALPRs


New York City Bus
2469
x27
Fidelity


NO ENGINE IDLING MAX FINE $2000
LED RADIATION




ELSAG DATAMAT
AD3-M
AUTODETECTOR3 MOBILE SYSTEM
E3 10 R - 02
e3 03 3031
LED RADIATIO
DO NOT VIEW DIRECT
WITH OPTICAL INSTRUME
CLASS 1M LED PRODU


POLICE
NYPD


T R U M P


ONE

NOT ALPRs
(nor red light cam)

NOT ALPRs
(red light cam)

WHAT'S THE BIG DEAL?

Police have been "running" plates forever

- Captures all plates in its field of vision
- retained in databases along with pictures from 21 days to 5 years (depends on jurisdiction)
- Enough APLRs and data points = tracked NYC: 108 fixed and 130 mobile APLRs as of 2009
- Impossible to opt-out

IS IT LEGAL TO DO THIS WARRENTLESS TRACKING?

YES

- **Hester v. United States** (1924) An observation made by a police officer without a physical intrusion into a constitutionally protected area does not implicate the Fourth Amendment nor require a search warrant.
- **United States v. Martin** (1986) A police officer who is lawfully present in an area may look into the windows of a parked car.
- **No reasonable expectation of privacy on your license plate in public**
- **Police do not need a warrant to "run" your plate**

WAIT A MINUTE THE SUPREME COURT RULED A WARRENT IS NEEDED FOR GPS TRACKING

YES BUT THIS IS DIFFERENT

United States v. Jones (2012) what the court said is that a warrant is needed to place the tracking device on the vehicle, not the act of tracking it.

I THOUGHT THE POLICE CANNOT USE ADVANCED SPY TECHNOLOGY WITHOUT A WARRENT

YES AND NO

- **Kyllo v. United States (2001)** infrared **cannot** be used to look inside a constitutionally protected area
- **Florida v. Riley (1989)** aerial surveillance **can** be used
- **United States v. Lee (1927)** artificial illumination **can** be used to aid observations
- **binoculars can be used** (no Supreme Court case but Scalia has said it is OK)

FEMA AS BEEN FUNDING LOCAL PDS 100% OF THE COST OF ALPRs

Department of Homeland Security FEMA
Grant Programs Directorate

Grant

PAGE 1 OF 2

1. RECIPIENT NAME AND ADDRESS (Including Zip Code)
Vermont Department of Public Safety
103 South Main Street
Waterbury, VT 05671-2101

4. AWARD NUMBER: 2009-SS-T9-0075

5. PROJECT PERIOD: FROM 08/01/2009 TO 07/31/2012
BUDGET PERIOD: FROM 08/01/2009 TO 07/31/2012

6. AWARD DATE 08/21/2009

7. ACTION
Initial

1A. GRANTEE IRS/VENDOR NO.
036000274

8. SUPPLEMENT NUMBER
00

9. PREVIOUS AWARD AMOUNT $0

3. PROJECT TITLE
FY 09 Homeland Security Grant Program

10. AMOUNT OF THIS AWARD $6,651,545

11. TOTAL AWARD $6,651,545

12. SPECIAL CONDITIONS

THE ABOVE GRANT PROJECT IS APPROVED SUBJECT TO SUCH CONDITIONS OR LIMITATIONS AS ARE SET FORTH ON THE ATTACHED PAGE(S).

13. STATUTORY AUTHORITY FOR GRANT

VERMONT DEPARTMENT OF PUBLIC SAFETY

State of Vermont
Standard Grant Agreement **Agreement #02140-79252-005**

Parties: This is a Grant Agreement between the State of Vermont, **Department of Public Safety** (hereinafter called "State"), and city of Burlington Treasurer / Burlington Police Department with principal place of business at 1 North Avenue, Burlington, VT 05401 hereinafter called "Subrecipient"). Subrecipient ☐ is/ ☒ is not required by law to have a Business Account Number from the Vermont Department of Taxes. The Account Number is #_____.

Subrecipient Federal Tax Identification Number: 03-6000410
Subrecipient DUNS Number: 614816635
Subrecipient Full Physical Address as provided on the CCR Registry (PO Box not acceptable):
1 North Avenue, Burlington, VT 05401

Subject Matter: The subject matter of this Grant Agreement is State Homeland Security Grant-Equipment. Detailed services to be provided by the Subrecipient are described in Attachment A.

Grant Term: The period of Subrecipient's performance shall begin on June 14, 2011 and end on December 31, 2011. "The State will not reimburse any expenses incurred prior to the execution date of this agreement. The execution date is defined as the date the Department of Public Safety representative(s) signs this agreement"

Maximum Amount: In consideration of the services to be performed by Subrecipient, the State agrees to pay Subrecipient, in accordance with the payment provisions specified in Attachment B, a sum not to exceed $22,460.00

Source of Funds: Federal Funds 100 %
Match required: ☐Yes ☒ No If Yes: $ N/A

CFDA Title	State Homeland Security Grant Program
CFDA Number	97.067
Award Name	FY 09 Homeland Security Grant Program;
Award Number	2009-SS-T9-0075;
Award Year	2009;
Federal Granting Agency	U. S. Department of Homeland Security;
Research and Development Grant? Yes ☐ No X☐.	

Amendment: No changes, modifications, or amendments in the terms and conditions of this Grant Agreement shall be effective unless reduced to writing, numbered, and signed by the duly authorized representative of the State and Subrecipient.

Cancellation: This Grant Agreement may be suspended or cancelled by either party by giving written notice at least 30 days in advance.

Contact persons: The Subrecipient's contact person for this award is: Andi Higbee, Deputy Chief
Telephone Number: 802-540-2111 E-mail address: ahigbee@bpdvt.org

ELSAG North America Law Enforcement Systems, LLC

412 Clocktower Commons
Brewster, NY 10509
Duns # 196140821
Phone: 1-866-9MPH900 (967-4900)
Fax: 336-379-7164

DATE

5/3/2011
QUOTATION

Delivered to:

Burlington Police Dept.
Att: Lt. Jennifer Morrison
1 North Ave.
Burlington, Vermont 05401

Quotation valid until: August 31, 2011
Prepared by: Pat Fox

Projected Arrival Date: TBD

(Please mail your PO to the address above or FAX copies to the number above and also FAX a copy to (518) 452-7777.

Receipt of Goods

NASPO Multi-State Contract #PC62119 Award #19745
(California Participating Addendum)
WSCA # PC 62119 Hazardous Incident Response Equipment
(Contract term: September 2, 2005 - May 31, 2015)

Model #	Description	Cost	Units	Amount
MPH-900X2AD3 SPLIT TRANS	Mobile License Plate Reader - Includes two units with LPR Processors, camera (color and IR LPR); Infrared illuminators, enclosures, junction box, cables and related software. (REQUIRES INSTALLATION BY AUTHORIZED ELSAG N.A. PERSONNEL)	$16,350	2	$32,700.00
MPH-900 INSTALL	IN A TRANSPORTABLE RUGGEDIZED CASE. Hedley mounts with a CLICKER to be mounted on a Ford Crown Victoria's.			
OPERATION CENTER LICENSE	Operations Center License	$975	2	$1,950.00
ADDITIONAL CAR KIT	1 extra power cord ($125.00), 1 extra ethernet cable ($100.00) and 1 extra GPS unit with USB extension ($110.00) for a Total of $335.00 to power up an additional vehicle.	$335	2	$670.00
EXTENDED WARRANTY	3 yr. extended warranty @ $1,600.00 per year times 3 yrs. For a Total of $4,800.00 per LPR unit times 2 units for a Total of $9,600.00.	$9,600		$9,600.00
			TOTAL	$44,920.00

Service Plan for goods and services provided by the above quote

Year I	Free		
Year II	$1,600.00 per year per LPR unit	Hardware and Software	
Year III	$1,600.00 per year per LPR unit	Hardware and Software	
Year IV	$1,600.00 per year per LPR unit	Hardware and Software	

Service Plan Includes:
- Software Updates
- Annual Training/Service
- Parts & Labor

Approval Signature: _____

ALPR DATA RETENTION

- **NH: general ban**
- **ME: 21 day maximum for non-hit non-criminal investigations**
- **NJ: must retain for a full 5 years, and then must destroy after 5 years**
- **NYC: retained for 5 years. Even though general surveillance video is deleted after 21 days if no active investigation**

IS THE DATA PUBLIC OR OPEN TO LEGAL DISCOVERY?

- Public? Maybe. Minneapolis released then recanted. GPS coordinates for their fixed readers was redacted.
- Discovery? NY has what is known as Rosario material, “Any written or recorded statement…made by such witness…which relates to the subject matter of the witness’s testimony.” However NY claims that ALPR data is not a "statement" so therefore it is not Rosario, and not subject to discovery.

ACTUAL LPR DATA (MOBILE UNIT)

BOSS3

10/22/2012 10:48:58

Read Details

William Palmer

MANUAL ENTRIES

MPDMDC6SQ2387 - Unit 995

186CMR	10/7/2012 10:50:19	44.9782	-93.2631	
186CMR	10/7/2012 10:30:32	From Hotlist = 44.9782	-93.2632	
186CMR	10/7/2012 10:16:50	From Hotlist = 44.9776	-93.2626	
186CMR	8/14/2012 15:09:52	From Hotlist = 44.9777	-93.2626	

From Hotlist =

Total Reads for MPDMDC6SQ2387 - Unit 995 = 4

ACTUAL LPR DATA (FIXED REDACTED, THEN MOBILE)

BOSS3

Read Details

12/11/2012 10:07:28

William Palmer

[redacted]

[redacted]

SKA189 10/2/2012 19:08:52 [redacted]

From Hotlist =

Total Reads for [redacted] = 1

Total Reads for [redacted] = 1

MANUAL ENTRIES

MPDMDC3MD2448

SKA189 11/30/2012 11:17:44 44.9772 -93.2664

From Hotlist =

SKA189 9/17/2012 08:37:57 44.9771 -93.2664

From Hotlist =

Total Reads for MPDMDC3MD2448 = 2

IT MAY NOT MATTER WHAT RETENTION LAWS ARE, AS THERE IS A COMMERCIAL MARKET

- **Vigilant Solutions. it's only customers are Law Enforcement. Its in 28 Metro areas, >35 million reads/month, collected by non-law enforcement scout cars**
- **Tow operators driving and scanning everything, looking for repo hits, but then sell the data.**
- **Law Enforcement will just purchase the data**
- **<u>You</u> can buy it for $10 a pop from tlo.com**


IMPALA
FLEXFUEL
NEW YORK
FWF 6071


Vigilant Video

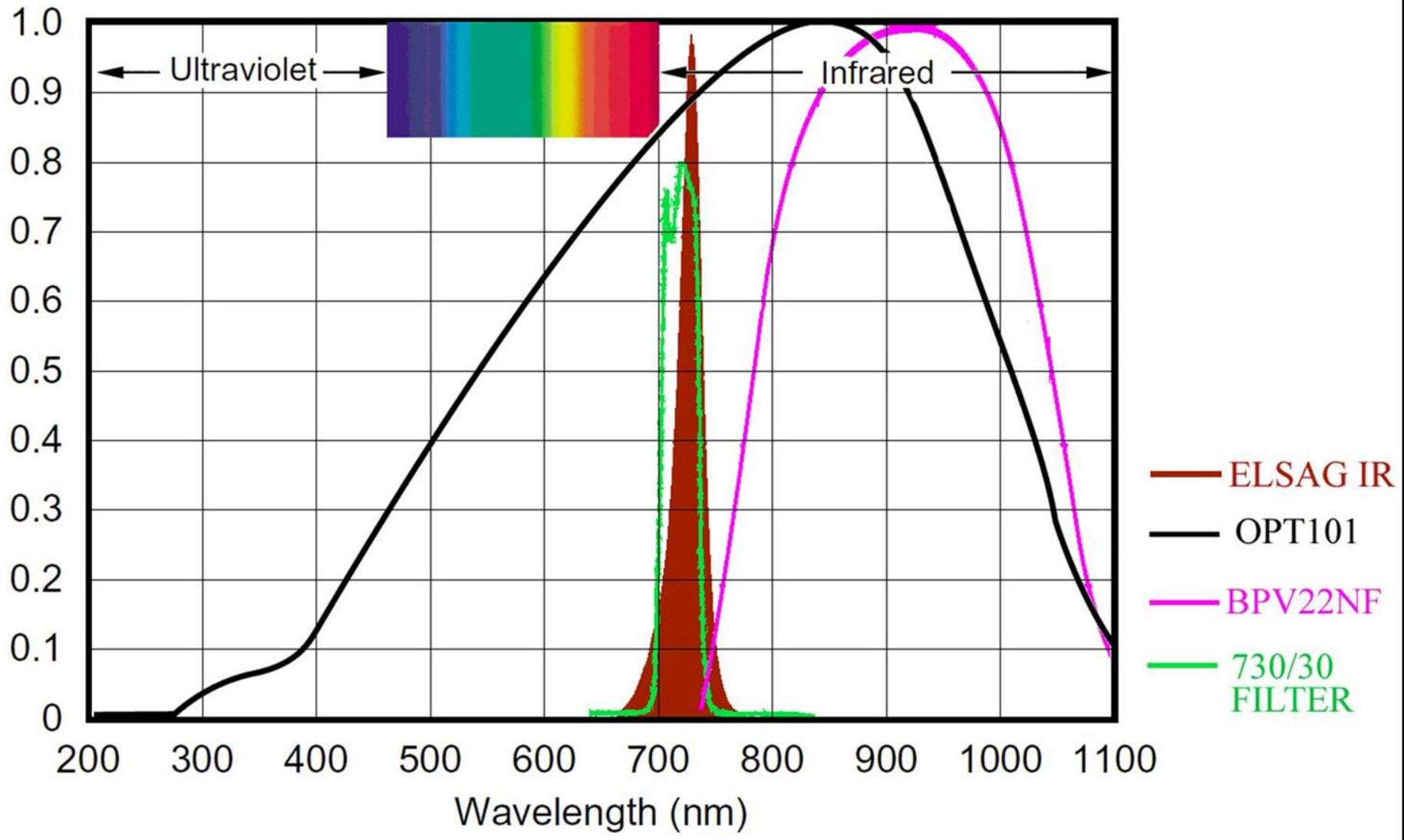
BUILD A LICENCE PLATE READER DETECTOR

- It uses infrared LEDs to illuminate the plate
- Its always on, and it is always pulsating to try to get the best exposure
- So we should be able to detect, by just using IR photodiodes right?
- Had a few failures to work
- Standard IR is 850nm. ELSAGs unit uses 735nm LEDS which near-IR (or far-red)

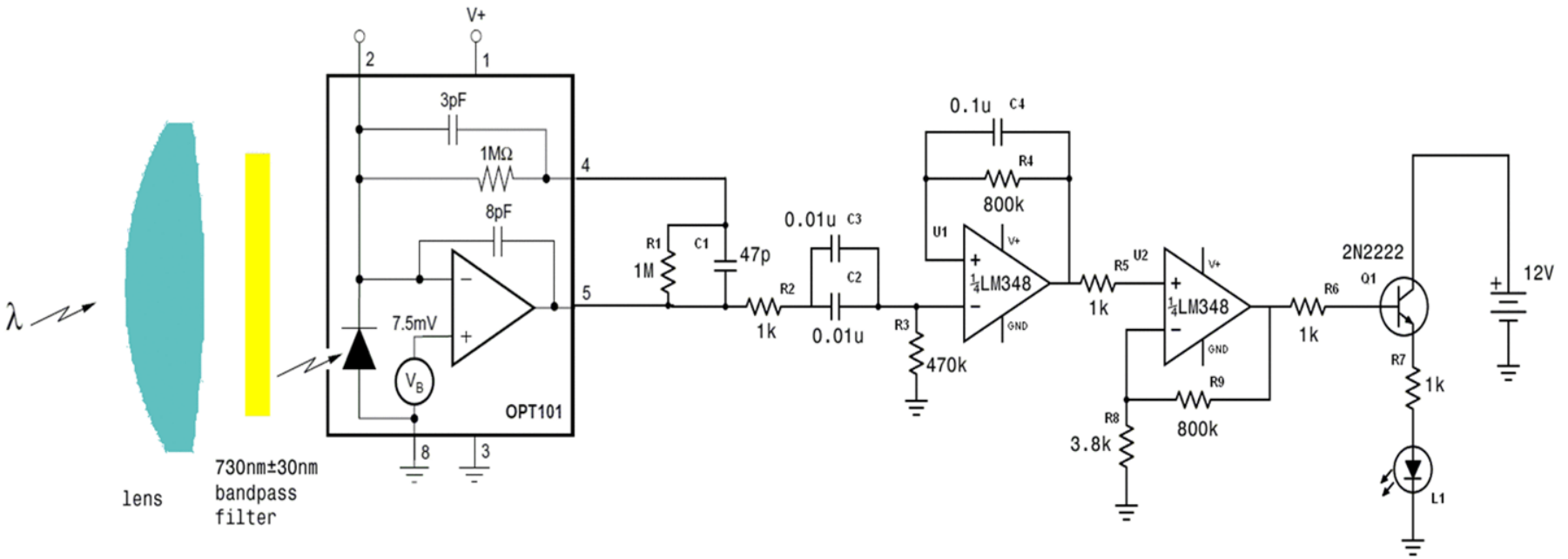
720nm IR PASS

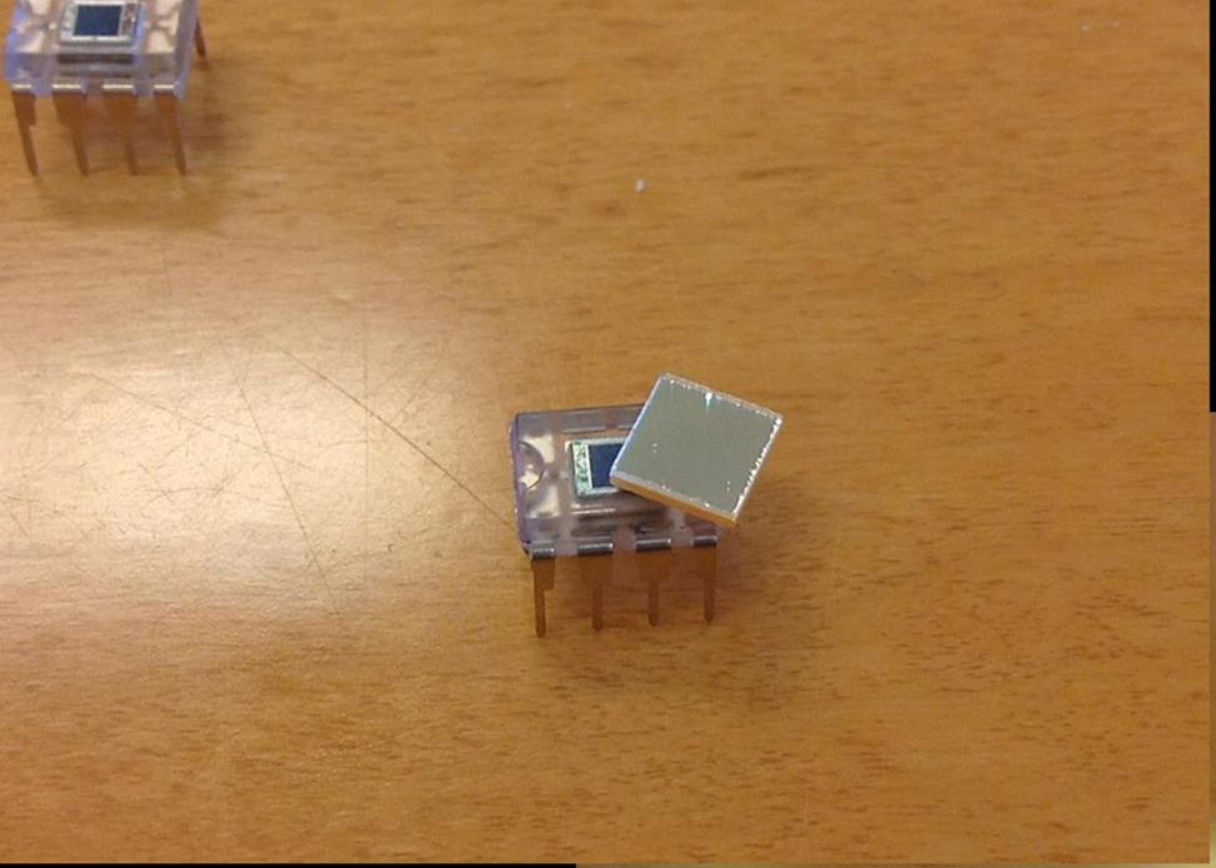
730±30nm BANDPASS

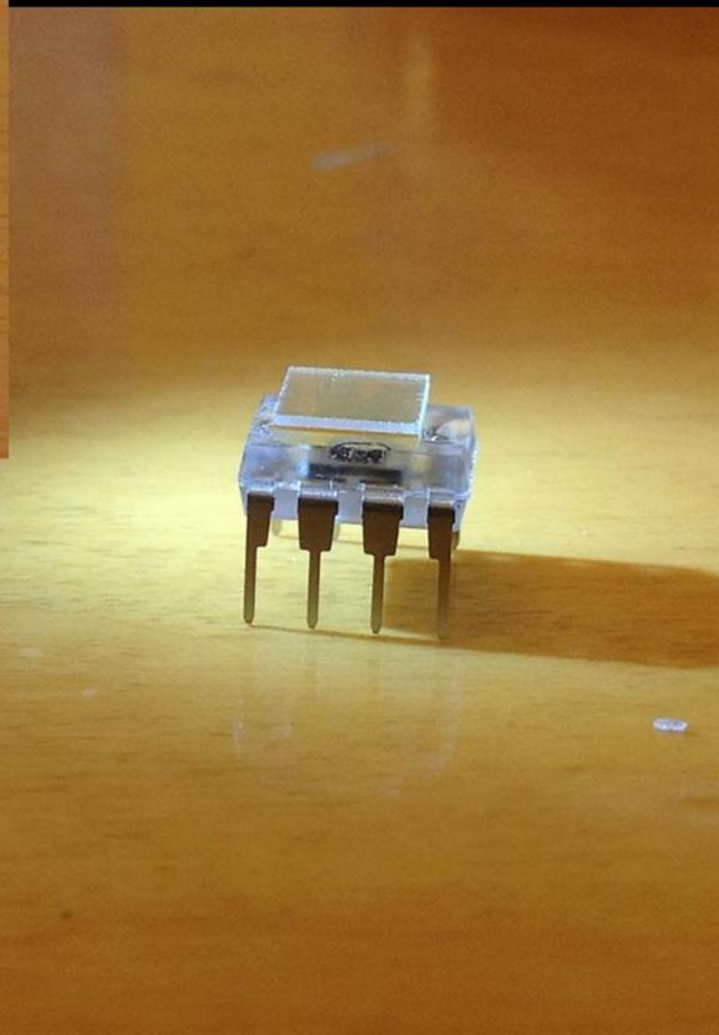
WHY STANDARD IR PHOTODIODES WON'T WORK

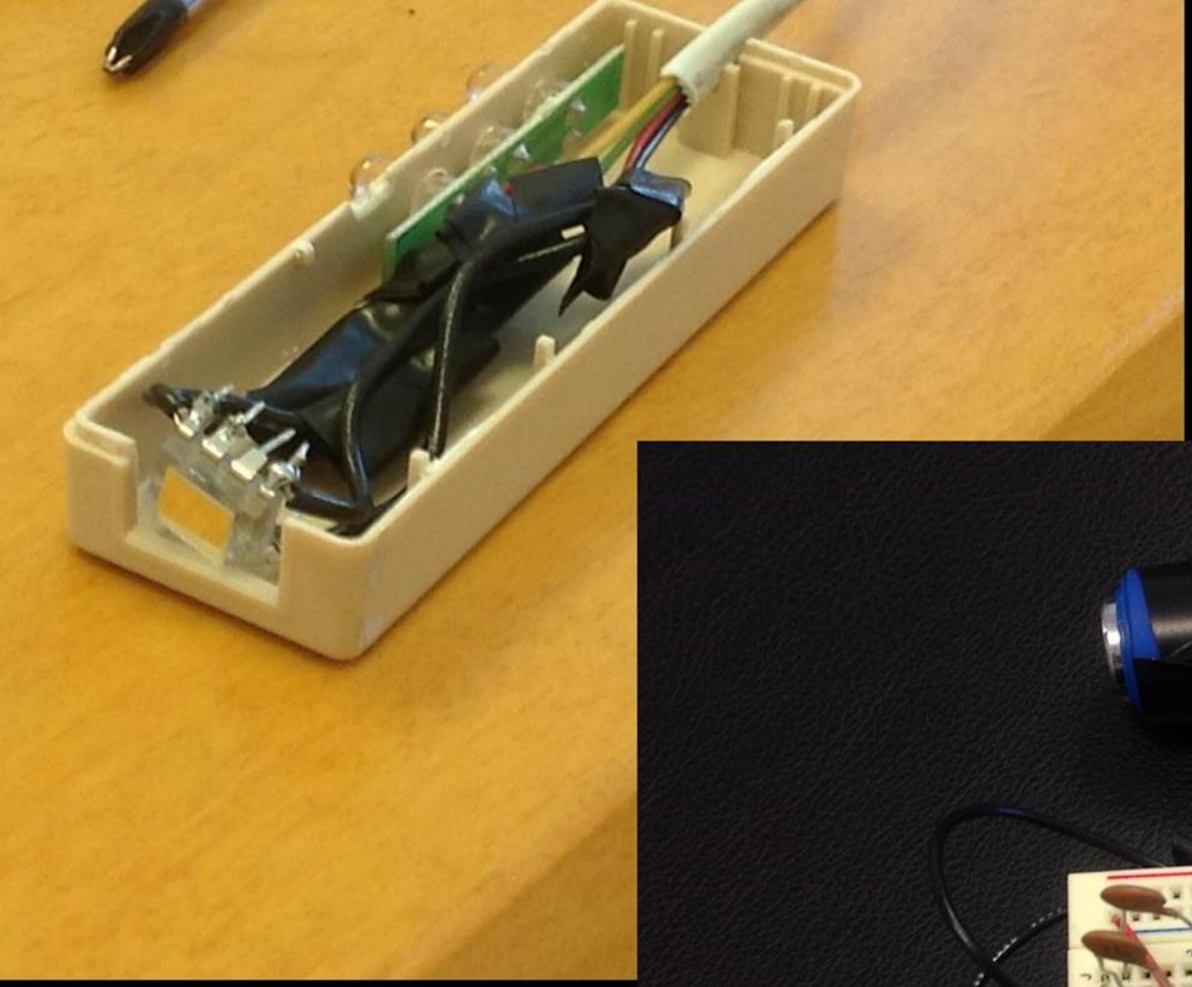


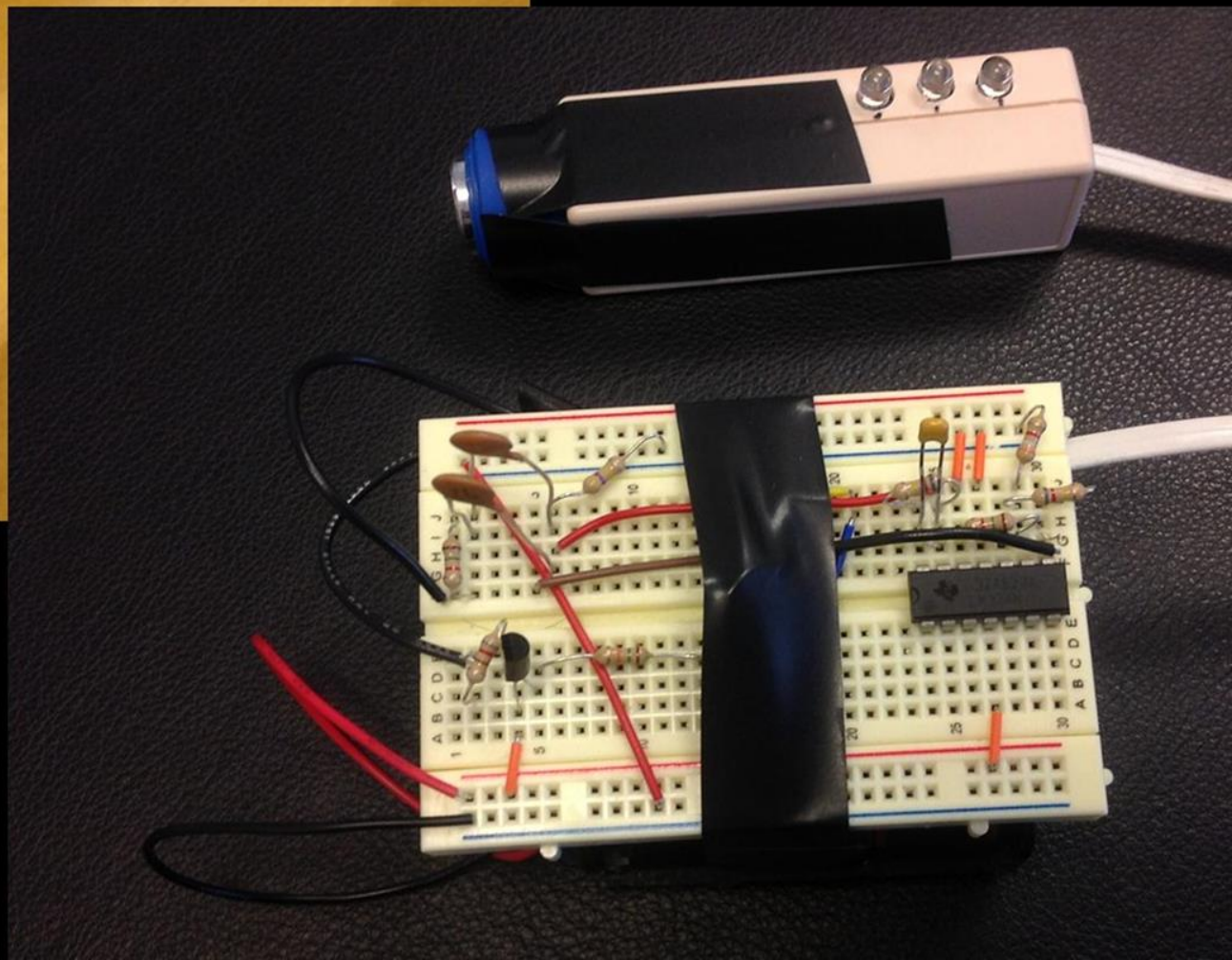
Working basic ELSAG Circuit







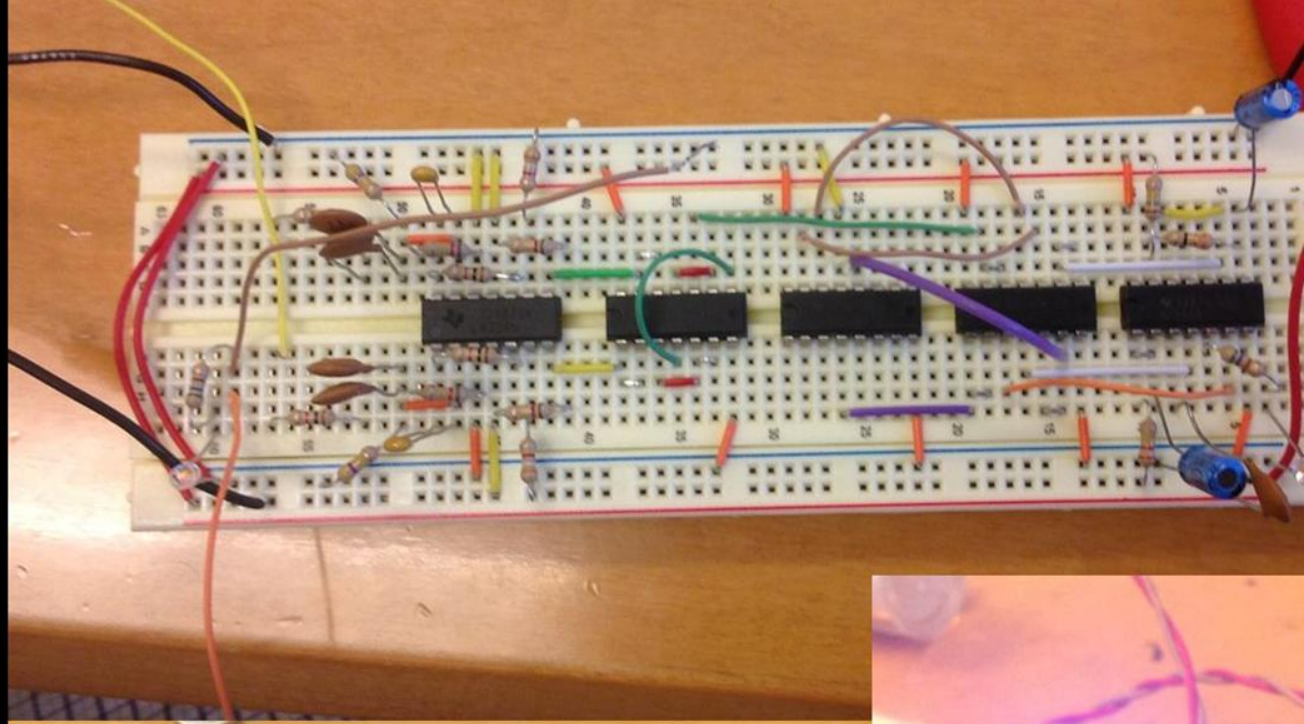




Video: proof of concept ALPR detector

Also available at http://youtu.be/1YTl36N1HHM

It eventually turned into this. The monkey screams When it detects an ALPR




FRIDAYS
FRIDAYS

Video: monkey screams when plate is read

also available at http://youtu.be/FjBTYEVVpdQ

WHAT TO DO?
Well Steve Jobs never had plates

Creative Commons image flickr:lodev

MAYBE LAW ENFORCEMENT CAN HELP


Accord
NEW YORK
5549

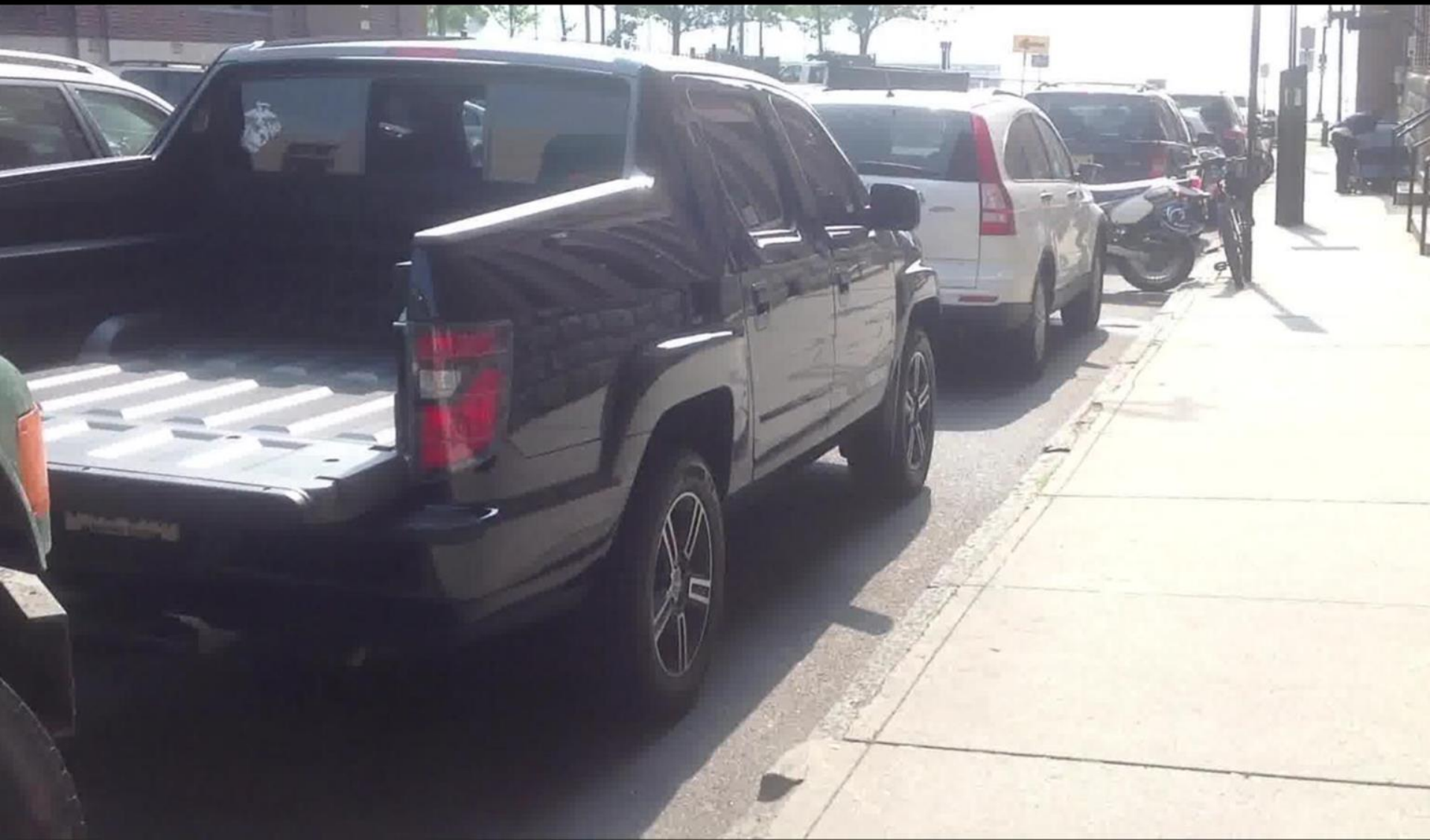

GVW 19,000


NEW YORK
EFF-2[redacted]3
THE EMPIRE STATE


NEW YORK
EFF-2[redacted]3
THE EMPIRE STATE

Drive with the tail gate down?

Yep seems to be a thing, different day




MAXIMA

WHAT DO COPS DO?

- No front plate, even if required
- Heavily mask the back plate with dark plastic or alternating Fresnel lenses
- Drive with the tail gate down
- Also tint you windows and windshield….
- You CANNOT do any of this legally
- Don’t want any extra interaction with law enforcement

TEMP TAGS

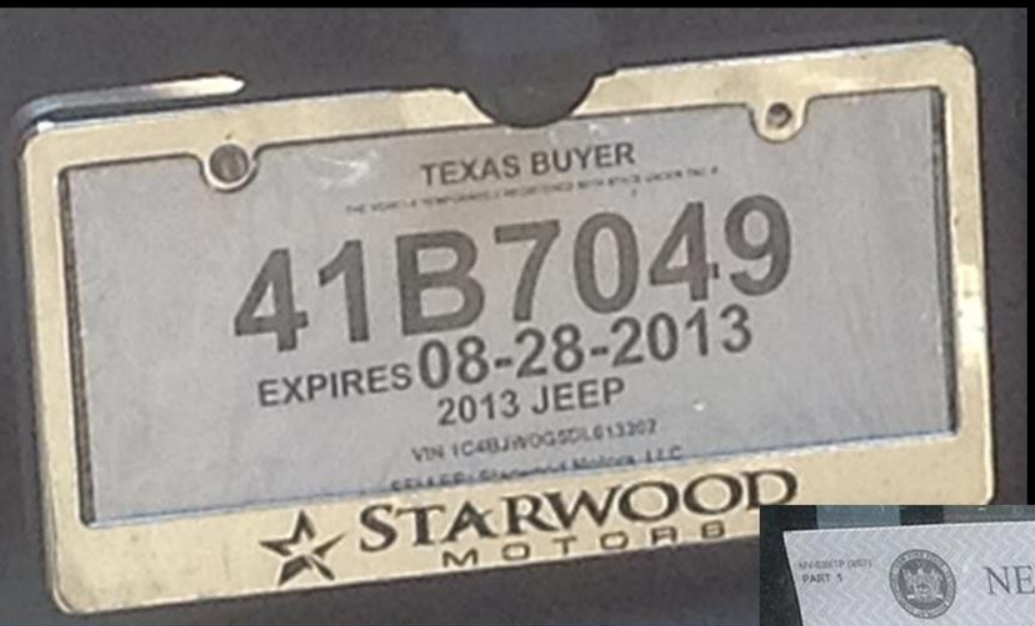

NISSAN
MARYLAND
Exp:04/17/2013
T687522
PASSPORT


TEMPORARY PERMIT
ILLINOIS • TEMP
366P697
Mercedes


WWW.PAULMILLER.COM
New Jersey
30 Day Resident Temporary Plate
F674397
00056N Issued:04/10/2013
VIN:WBAVL1C57DVR89298
2013 BMW X1 WHI
EXP MAY 09,2013


COLORADO
TEMPORARY REGISTRATION
AUG 02 13
182848L

TEMP TAGS



BE WARNED THAT NY TEMP TAGS ARE NOT HONORED IN MA, CAR WILL BE IMPOUNDED

WHAT ARE THESE?

No number
VIN and
Expiration date

How de we get
them?

- **CA you can drive a new car with no tags for 90 days (was 6 months while Jobs was alive) and cannot drive outside of CA**
- **Most temp tags are only good 20 to 90 days**

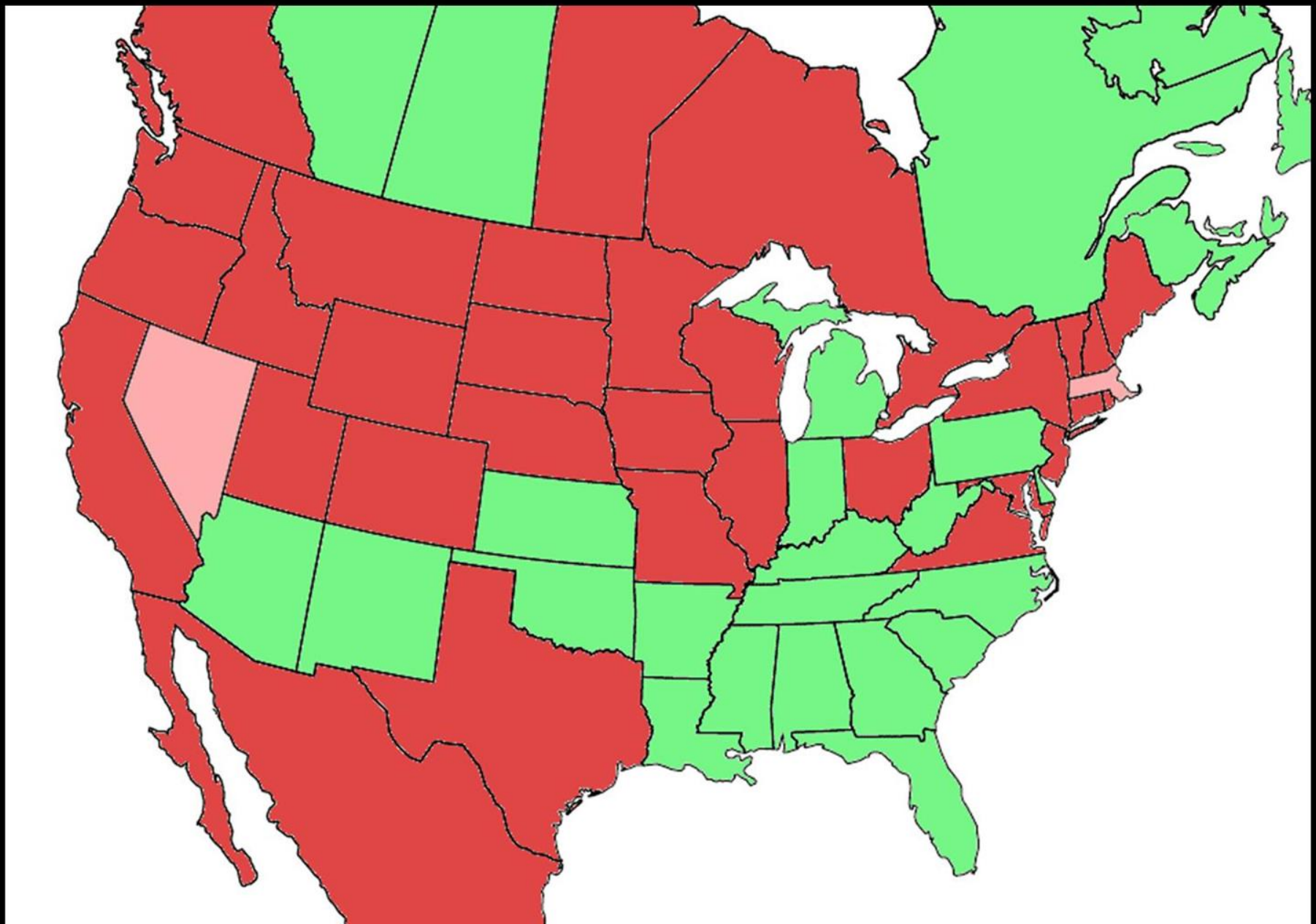
- **Registering you vehicle to a company hides you in a thin veil, but still plates are recorded**
- **But do NOT get commercial tags**

PERILS OF COMMERCIAL PLATES

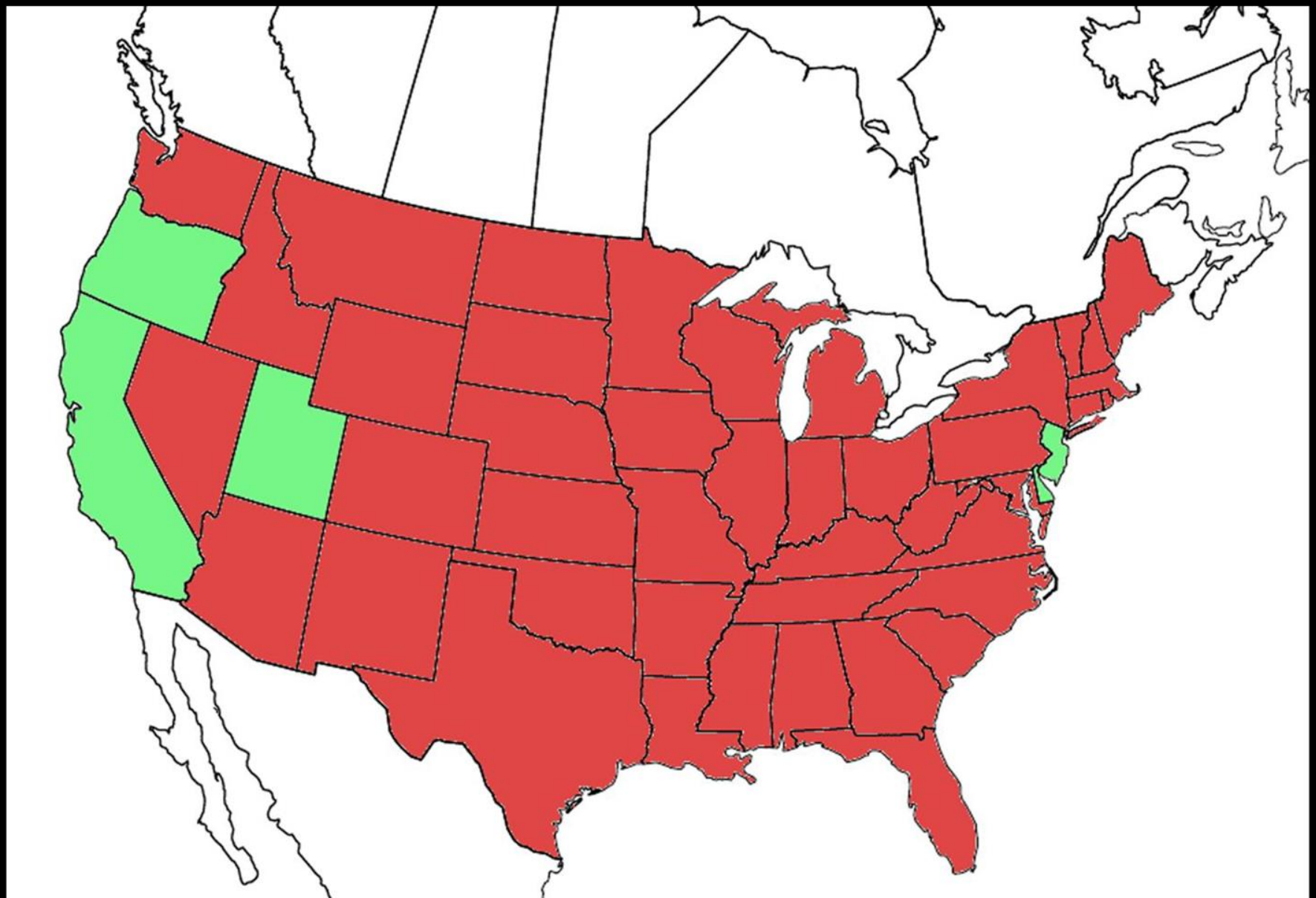
WHAT IS HARDEST FOR ALPR

- Non reflective plates
  - Crime to remove reflectivity in CA
  - Failed inspection in MA if you plate looses reflectivity
- Low contrast plates
- Light red characters
- With 3 or more stacked letters
- Registration stickers that need to be placed close to the letters
- 8 digit plates, smaller and narrower letters
- Also no front plate, means half the chance of being read

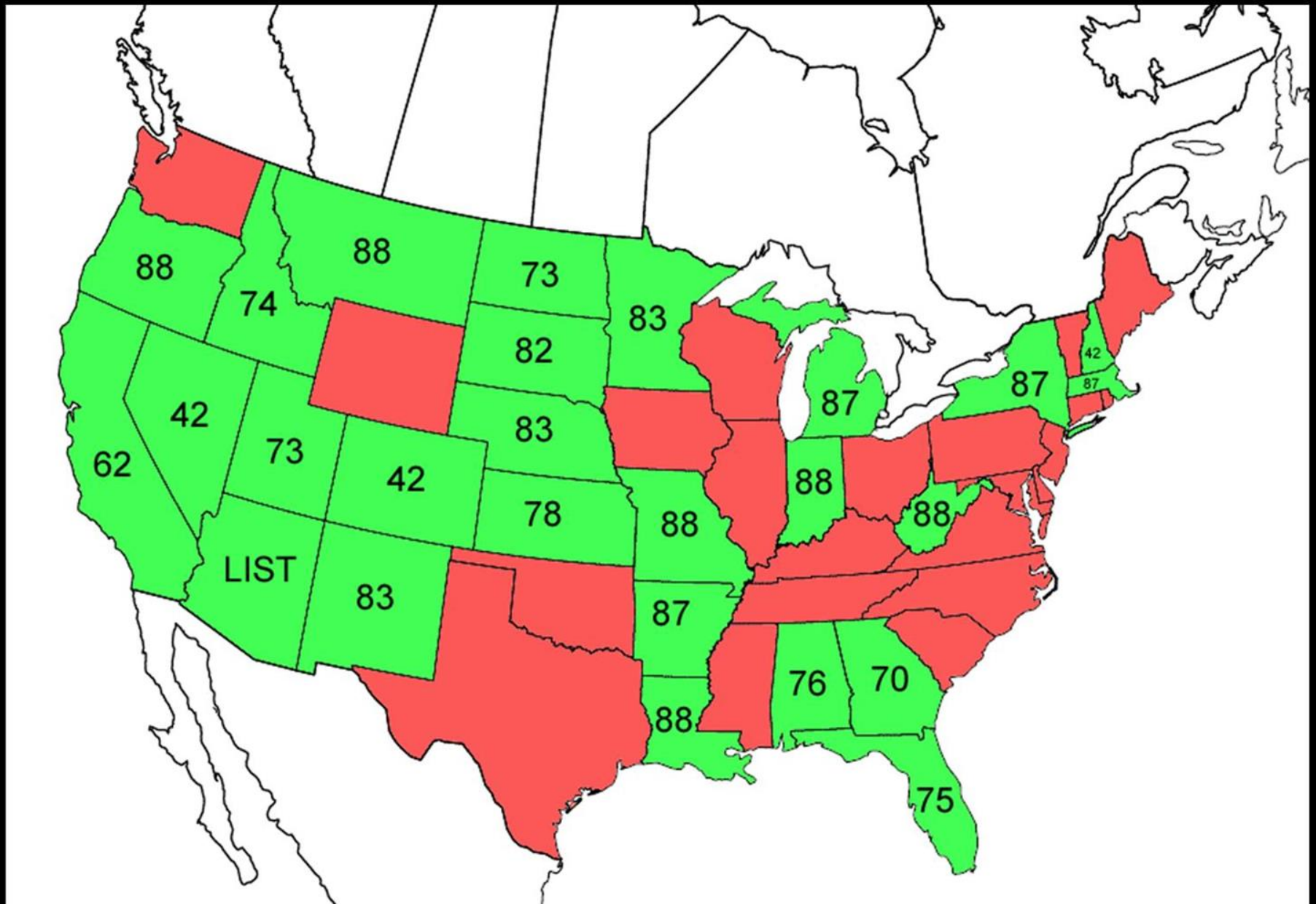
ONE VS. TWO PLATES



STATES WITH LEGAL NON-REFLECTIVE PLATES



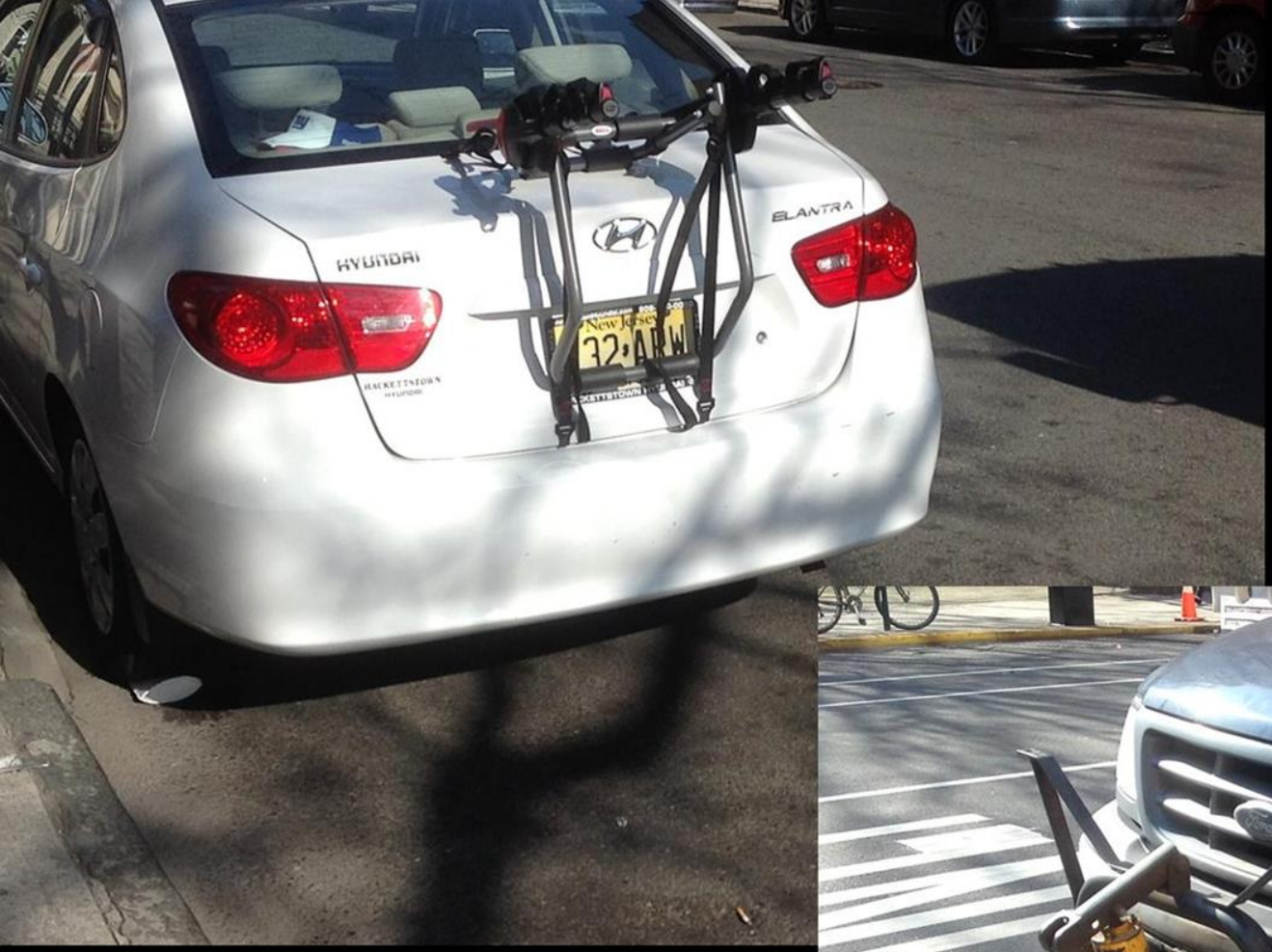
LATEST MODEL YEAR FOR YOM



OBSCURED PLATE

OBSCURED PLATES


WESTERN
1000
4X4


HYUNDAI
ELANTRA

“M” is not part of the plate number (with stacked letters)

BUMPER GUARDS

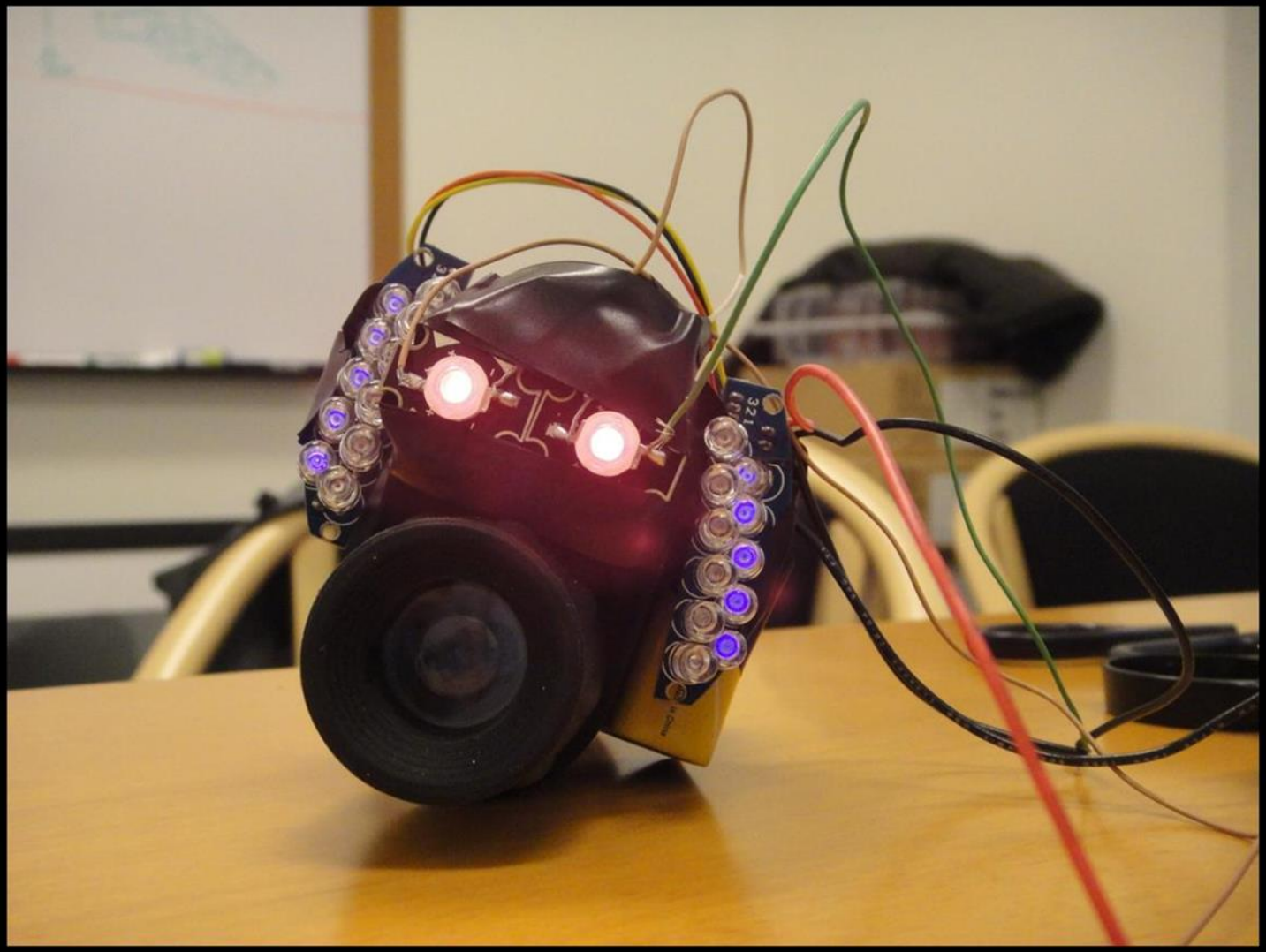
BUMPER GUARDS

LEGALLY OBSCURED FRONT PLATES

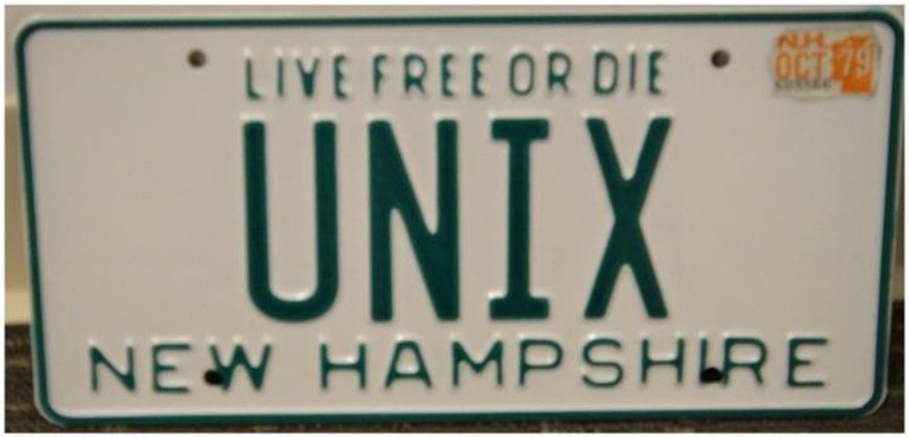
CAPTCHA PLATE

- NO! DO NOT DO THIS. CONSIDERD TRAMPEING WITH GOVERNMNET DOCUMNETS

IR CAMERA WITH 735nm AND 850nm

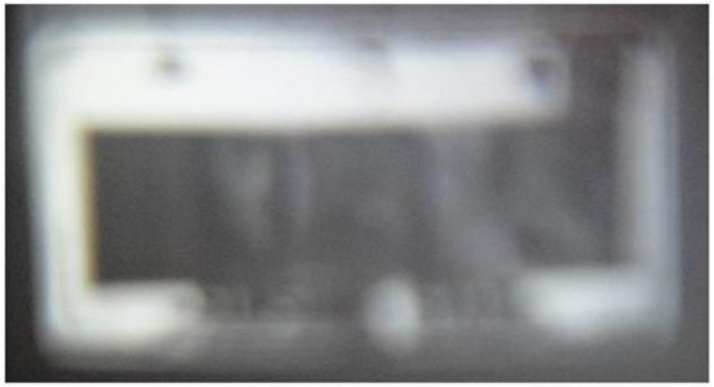


VISIBLE, IR VIEW, WITH IR BLOCK 850nm



VISIBLE, IR VIEW, WITH IR BLOCK 850nm

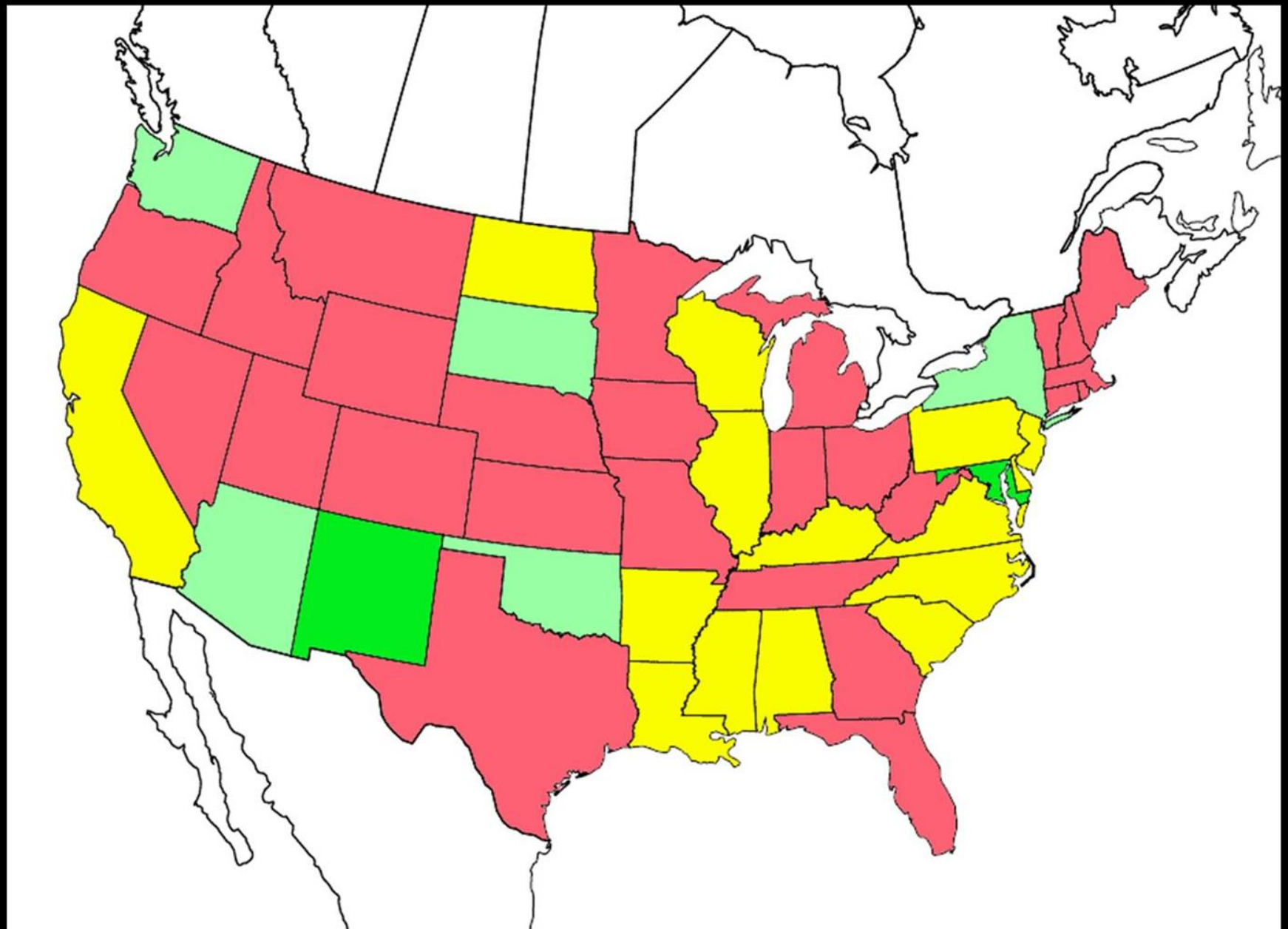
VISIBLE, IR VIEW, WITH IR BLOCK 850nm



LIGHLTY SALTED PLATE
VISIBILE, FLASH, IR 735nm

HEAVILY SALTED PLATE
VISIBILE, FLASH, IR 735nm

NUMBER OF STACKED CHARACTERS



NY (good) vs NJ (no good) 3 STACK

STATES WITH SPECIAL CHARACTERS

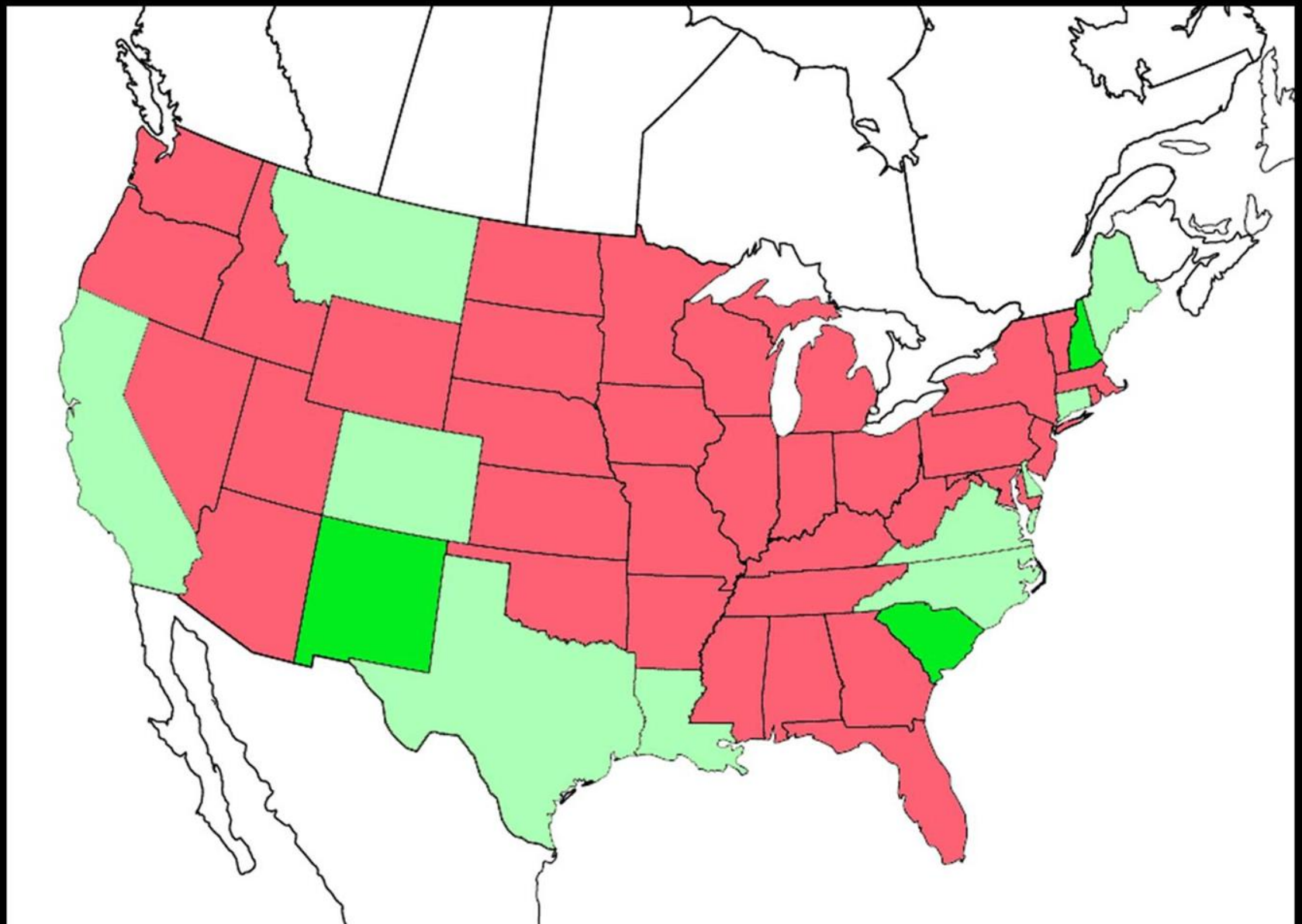
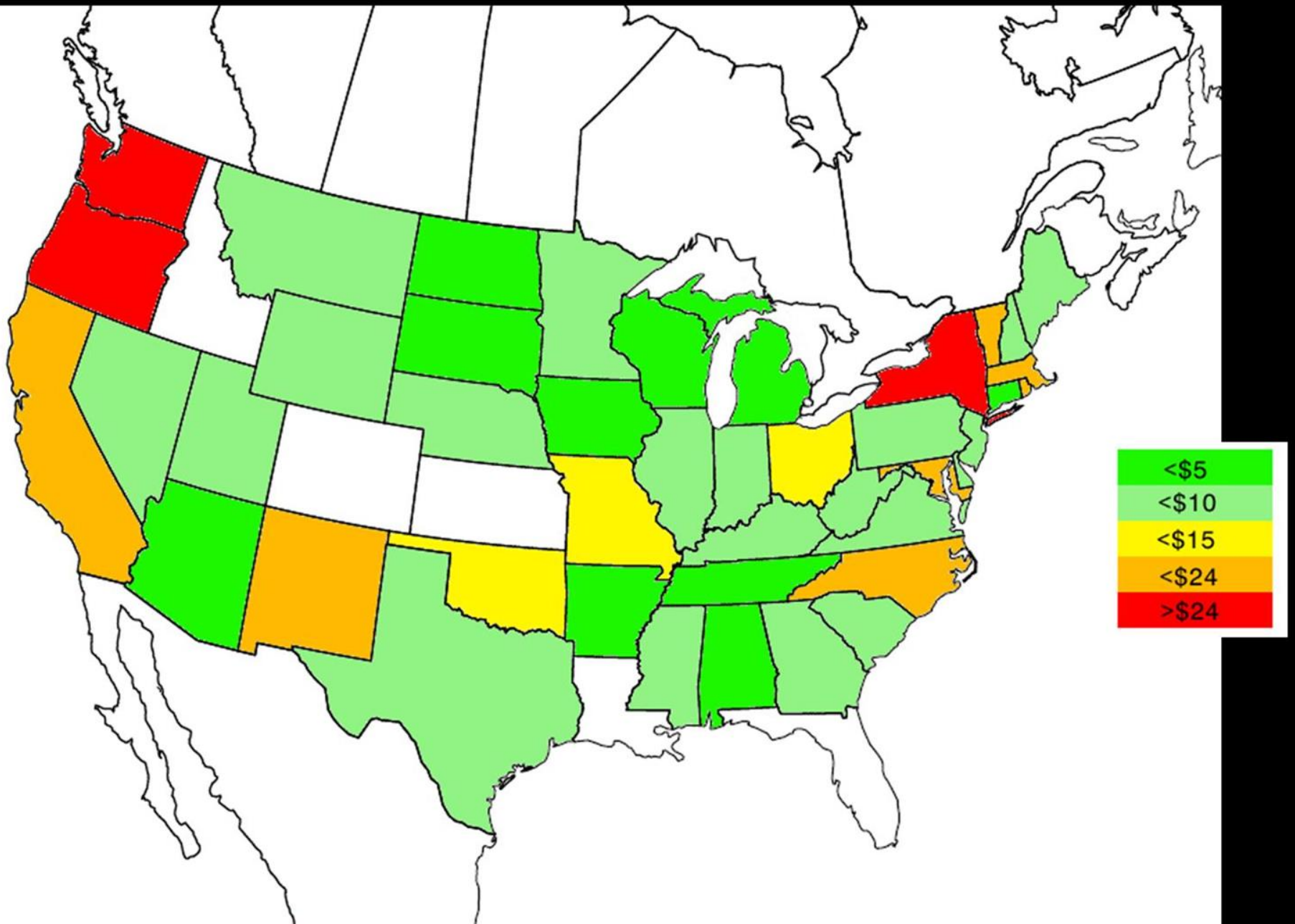
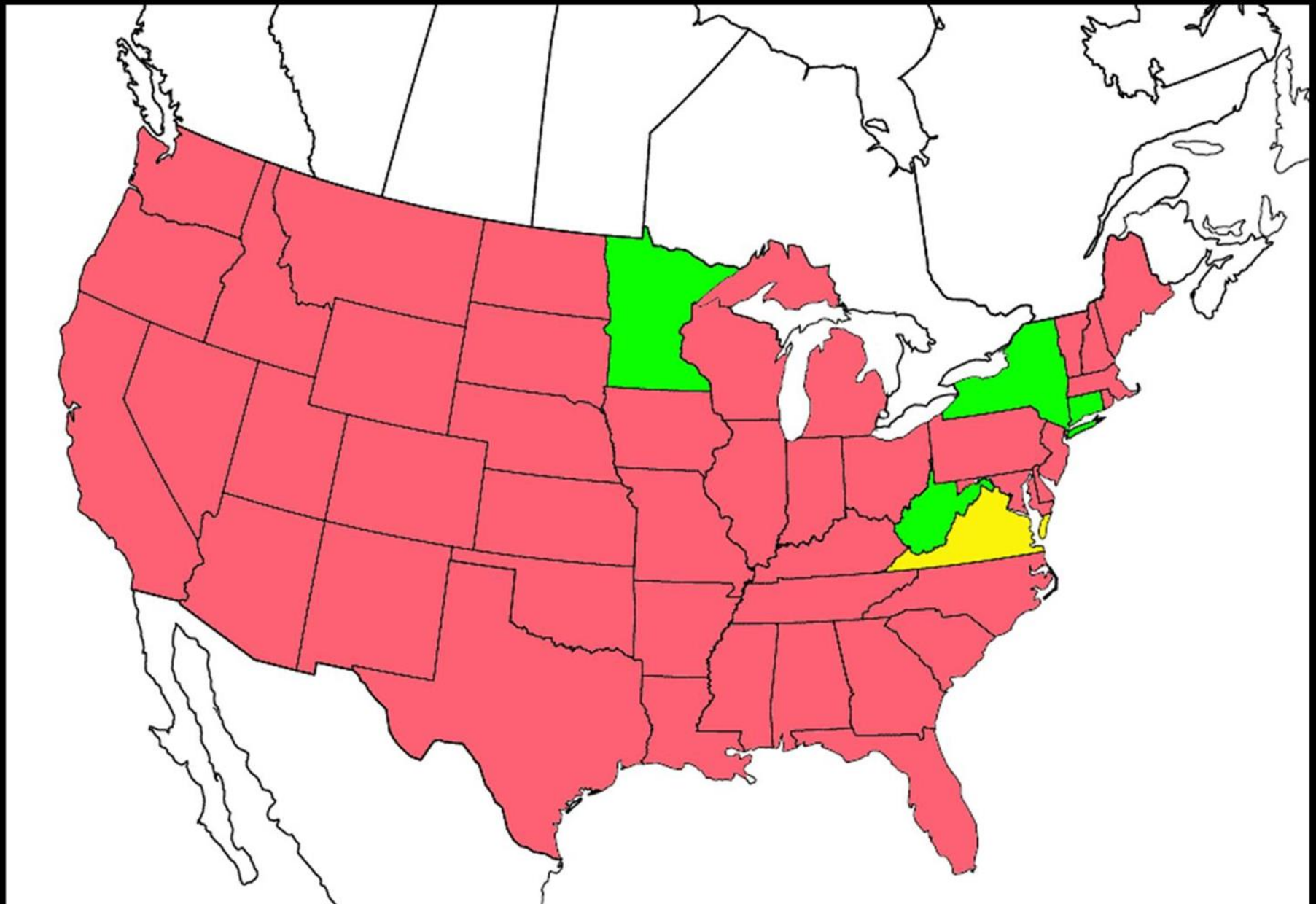


PLATE REPLACEMENT COST



8 CHARACTER PLATES

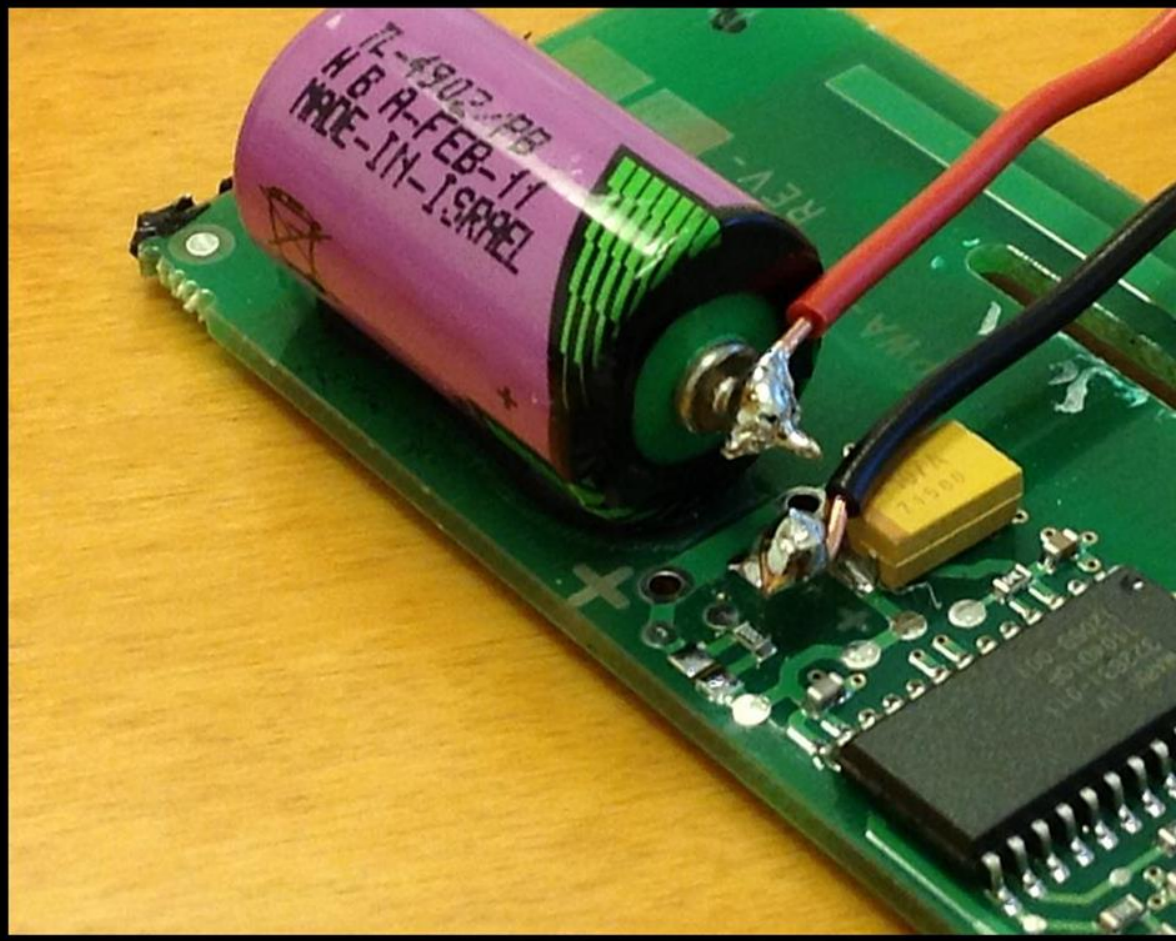


ELECTRONIC TOLL COLLECTION TAGS

- Always on
- All ETC is 915Mhz in the US
- Multiple non-compatible protocols
  - Interagency Group (IAG) (E-Zpass)
  - California Title 21
  - Allegro
  - eGo
- It’s RFID, some with battery asssit some without

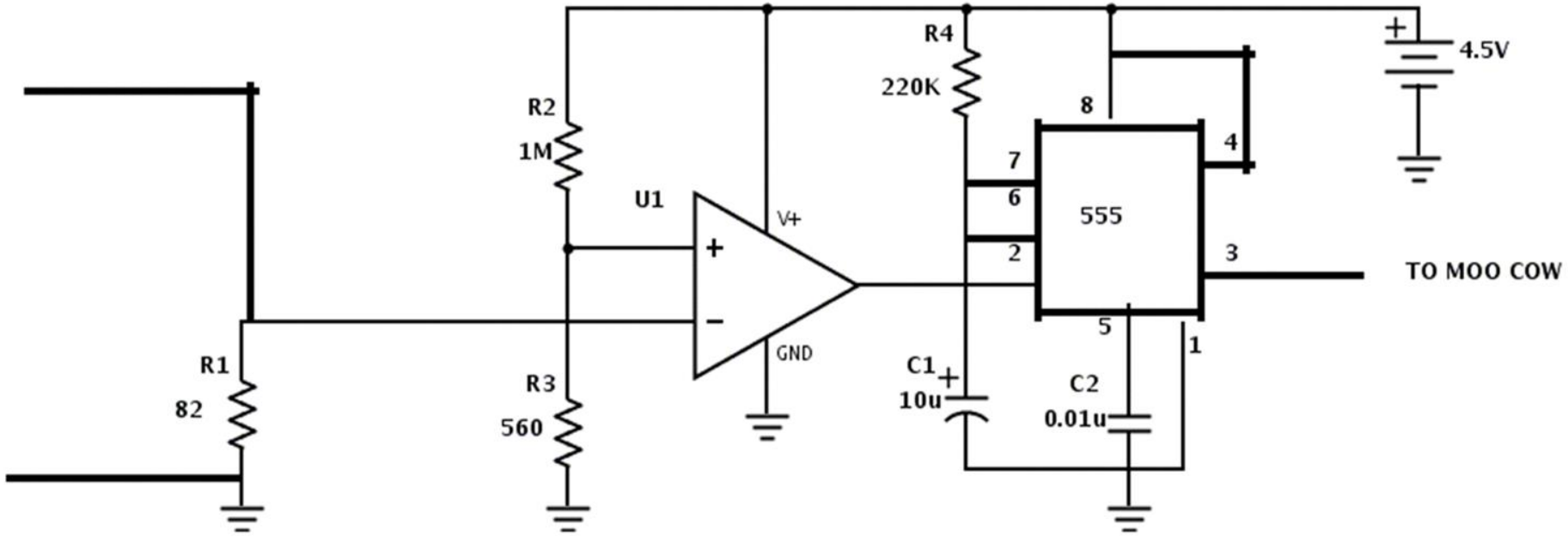
E-ZPASS TAG

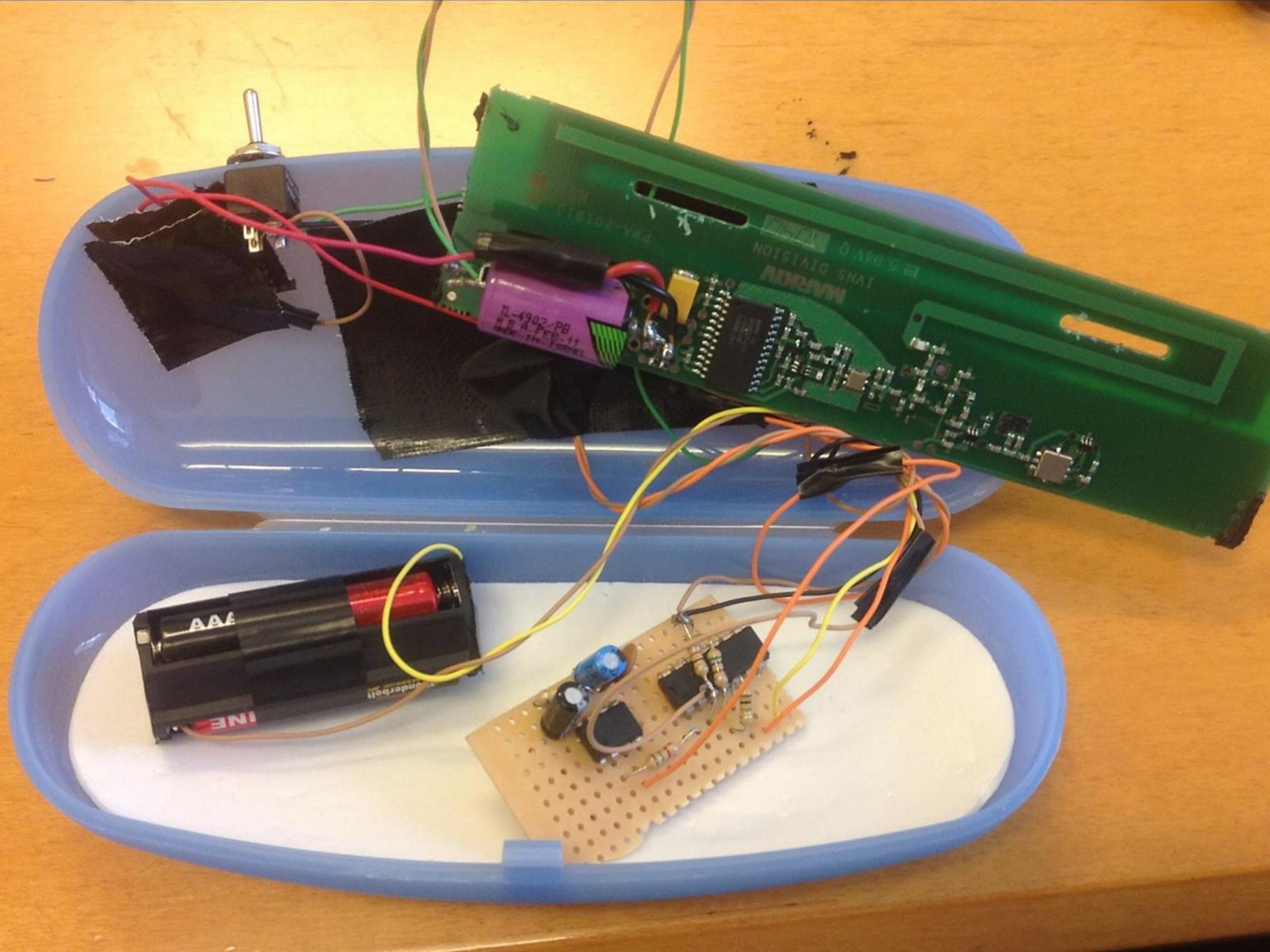
- 3.6V low draw, long life (10 year) battery
- Device draws 8uA quiescent
- Device draws 0.3mA when being read, transmitting
- DO NOT DO THIS, IT IS NOT YOUR PROPERTY



E-Z PASS READ DETECTION CIRCUIT

Low side (shunt R1 between circuit and ground)





E-ZPASS GETS READ UNDER THE SIGN, BUT NO TOLL AROUND HERE

SO THAT'S WHY!

NOT SO HIDDEN, BUT NO TOLL HERE


E-ZPass
ONLY
CASH AND
E-ZPass
E-ZPass
SPEED
LIMIT
35
RADAR
ENFORCED
13 FT 11 IN
FT 10 IN

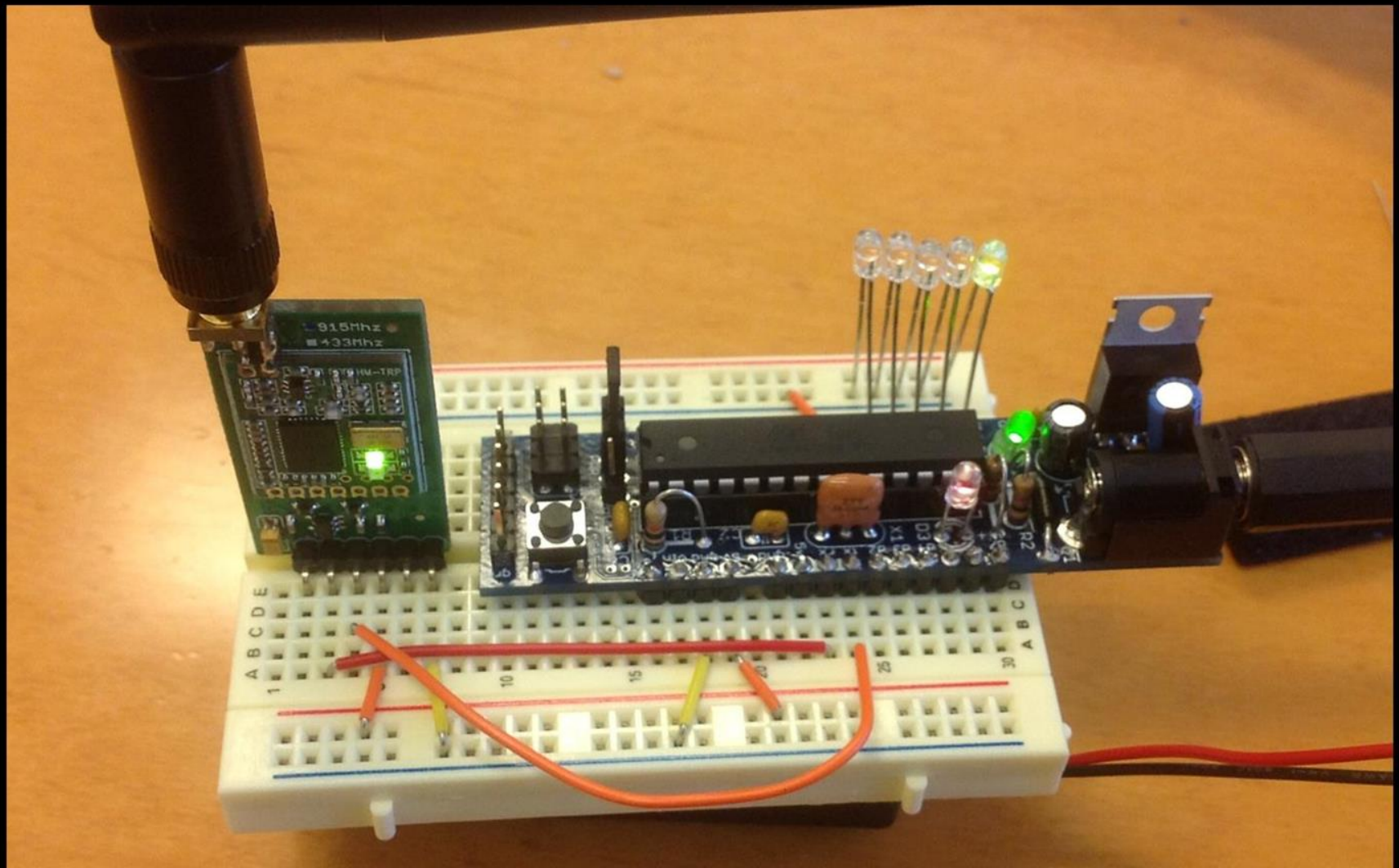
E-ZPASS GETS READ AT 42nd & 8th


NO
TURNS
BROADWAY
Sixth Ave
THE
WORLD'S
STORE
macy's

TransCore

Company can read all transportation formats, like ATA, eGo, IAG (reversed engineered), etc.

PROBLEM WITH TAG BASED DETECTOR IS YOU MUST BE READ TO FIND THEM NEED A BETTER ONE




SUGAR-FREE
ALTOIDS
smalls
naturally & artificially flavored
PEPPERMINT

Video: proof radio is good as and more sensitive than the original tag

Also available at http://youtu.be/UwBK_SpYJdo

Video: shows E-Zpass detector working at Holland Tunnel

Also available at http://youtu.be/IgjFz-rWQnY

42nd & 8th WITH NEW DETECTOR

Video: Time Square to Madison Square Garden in 90 secs

Also available at http://youtu.be/JCwWVxGtYgE

Video: exiting Manhattan (no toll), but E-Zpass still is read

Also available at http://youtu.be/eZUtHJVonL8

- NYSDOT admits they use it for "travel time" signs
- Who else gets and what happens to this data?
- How long is it retained?

- NYSDOT stated in 2007 that tag info for travel time is “scrambled by the system” and “deleted after the vehicle has left the highway”
- Could not verify this via their customer representatives. Security letter?
- No way to know if a read is by NYSDOT, NYPD, DHS or some other agency
- NY Times reports that the NSA does get E-Zpass data: “How the U.S. Uses Technology to Mine More Data More Quickly” by Risen and Lichtblau, June 8th 2013

WHAT TO DO?

- Bag the tag, and only bring it out when you want to pay a toll.
- If you have a sticker build a faraday cage box that you can swing open and shut
- Remember the toll is tracking you too
- It will become obvious to “watchers” you are doing this as you will be seen at tolls but no where else

YOUR TIRES

- Federal US TREAD (Transportation Recall Enhancement, Accountability and Documentation) law
- Two different things happing here
  - Tire Pressure Monitoring System (TPMS) 315MHz transmitter at the valve stem, not the tire, this is part of the rim. Has a battery and a unique ID
  - RFID in the tires themselves, unique per tire
    - Michelin uses 915MHz
    - Goodyear uses 125kHz
    - Auto manufactures place the VIN in these RFIDs as well

Creative Commons image wikipedia.org User:BMK Germany (http://en.wikipedia.org/wiki/File:Sicherheitsreifen_BMK.jp)

WHAT TO DO?

- Look for RFIDs and EMP them
- Locally jam 315MHz in the wheel well

OTHER RFID

- Parking passes, it might be an hang tag or a sticker you had to put on the glass
- Usually private, but found one municipally that put them in for residents to cut down on parking permit counterfeiting. It's 915Mhz too.
- Need to bag them too, if not in use, but a permit for public on street parking is a problem

INRIX

- collects position data from 100 million devices across 1.8 million miles of road
- Google maps uses them for traffic
- 6 of the 8 auto companies with built-in navigations systems (like Ford, BMW and Audi)
- 8 of the 12 top navigation apps in Apple's App Store (like MapQuest, Garmin, Microsoft and Telenav)
- dumb phones, without GPS and internet connections are sharing location data with them through cell towers
- Commercial truck fleets

CONCLUSION

- Salt the plate
- Bag the tag
- Zap and jam the tires
- Turn ‘em off