

RAIL
CROSSING
ROAD

**Vital Inductive Loop
Processor Detection**
August 6, 2014

Detection of Vehicles on a Roadway

Vehicle detection goes back to the beginning of actuated control of traffic signals.

It was recognized back in the 1930's that knowing the presence of a single vehicle or of multiple vehicles could be used to significantly increase the operational efficiency of a traffic signal.



Detection of Vehicles on a Roadway

One of the first known vehicle detectors used a microphone and amplifier to “listen” for a car horn.

Each motorist that approached the intersection was instructed to sound the vehicle horn in order to receive a green light.



Detection of Vehicles on a Roadway

Charles Adler is credited with the development of the sound detector for vehicle actuation.



**"To Obtain Signal - Stop Blow Horn,"
traffic-actuated signal light,
Charles Adler, Jr. Collection,
ca. 1920-1980**



Detection of Vehicles on a Roadway

Over the years, numerous devices and systems have been developed to detect vehicles.

Following the sound detector, pressure pad detectors became common. These devices were mechanical switches encased in rubber and mounted in a steel frame in the roadway.



Detection of Vehicles on a Roadway

Over the years, numerous devices and systems have been developed to detect vehicles.

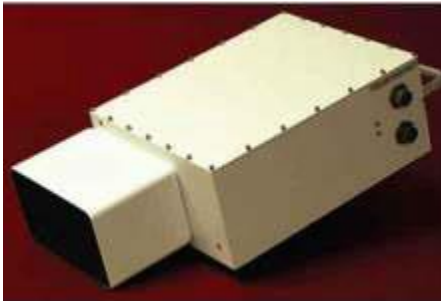
Automatic Signal Company developed an array of vehicle detectors including magnetic, radar, magnetometer and inductive loop.



Detection of Vehicles on a Roadway

Over the years, numerous devices and systems have been developed to detect vehicles.

Over time, virtually every technology known has been explored to develop a reliable and effective vehicle detector.



Detection of Vehicles on a Roadway

Over the years, numerous devices and systems have been developed to detect vehicles.



Video imaging and microwave radar detectors have seen an increase in use in recent years.



Detection of Vehicles on a Roadway

One technology, developed in the 1950's has been used now for decades and continues in widespread use today for detection of not just vehicles, but trains, light rail vehicles and, in some cases, aircraft.

Why?

Reliability and simplicity



Detection of Vehicles on a Roadway

Why is the inductive loop reliable and simple?

It is based on solid electro-magnetic principles, changes in which can be measured and processed with very basic equipment.



Inductive Loop Theory – How an Inductive Loop Detects a Train

- Detection of vehicles or trains occurs when the loop field is entered, the body and frame provide a conductive path for the magnetic field.
- This produces a loading effect, which in turn causes the loop inductance to decrease.

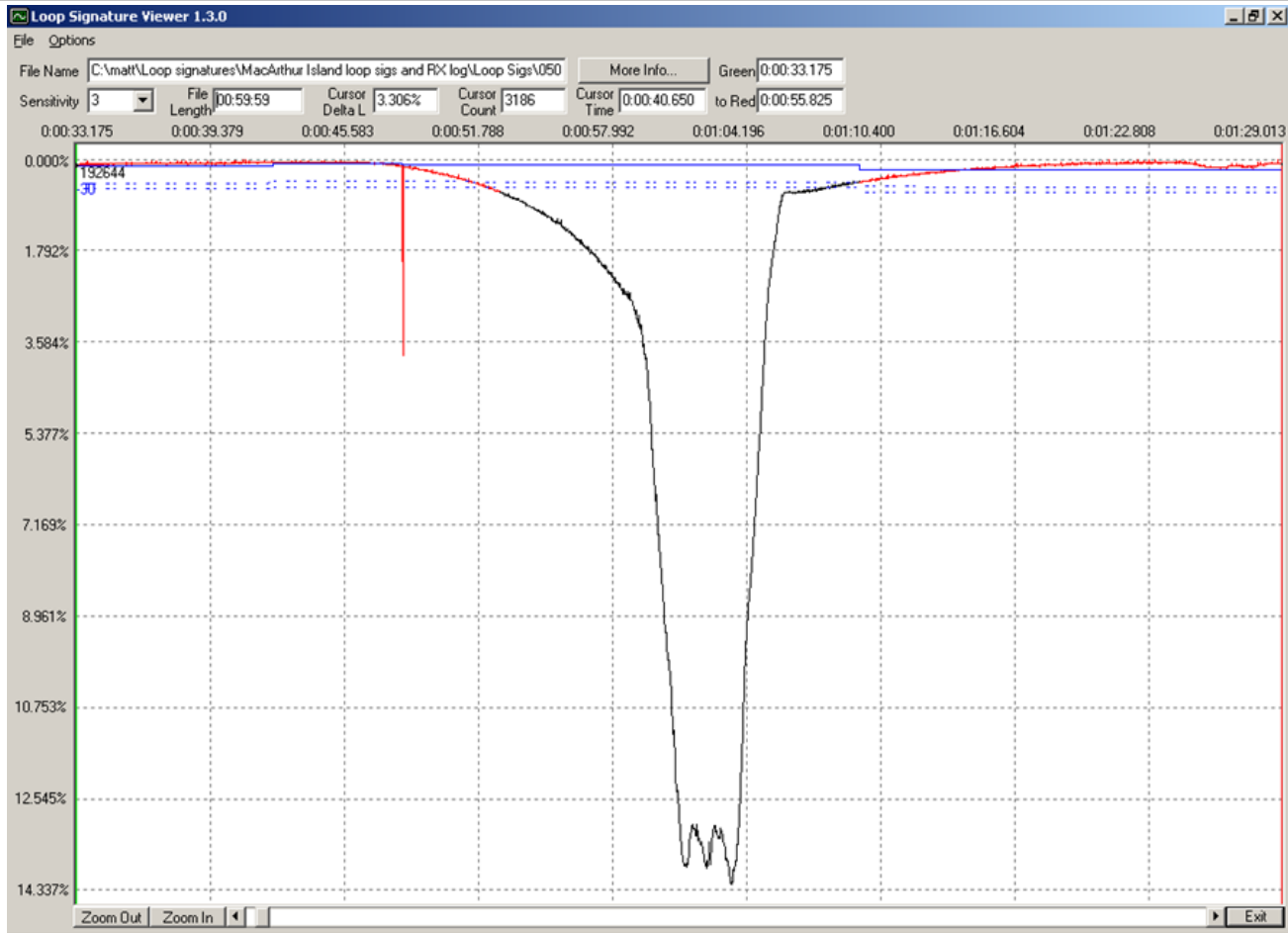


Inductive Loop Theory – How an Inductive Loop Detects a Train

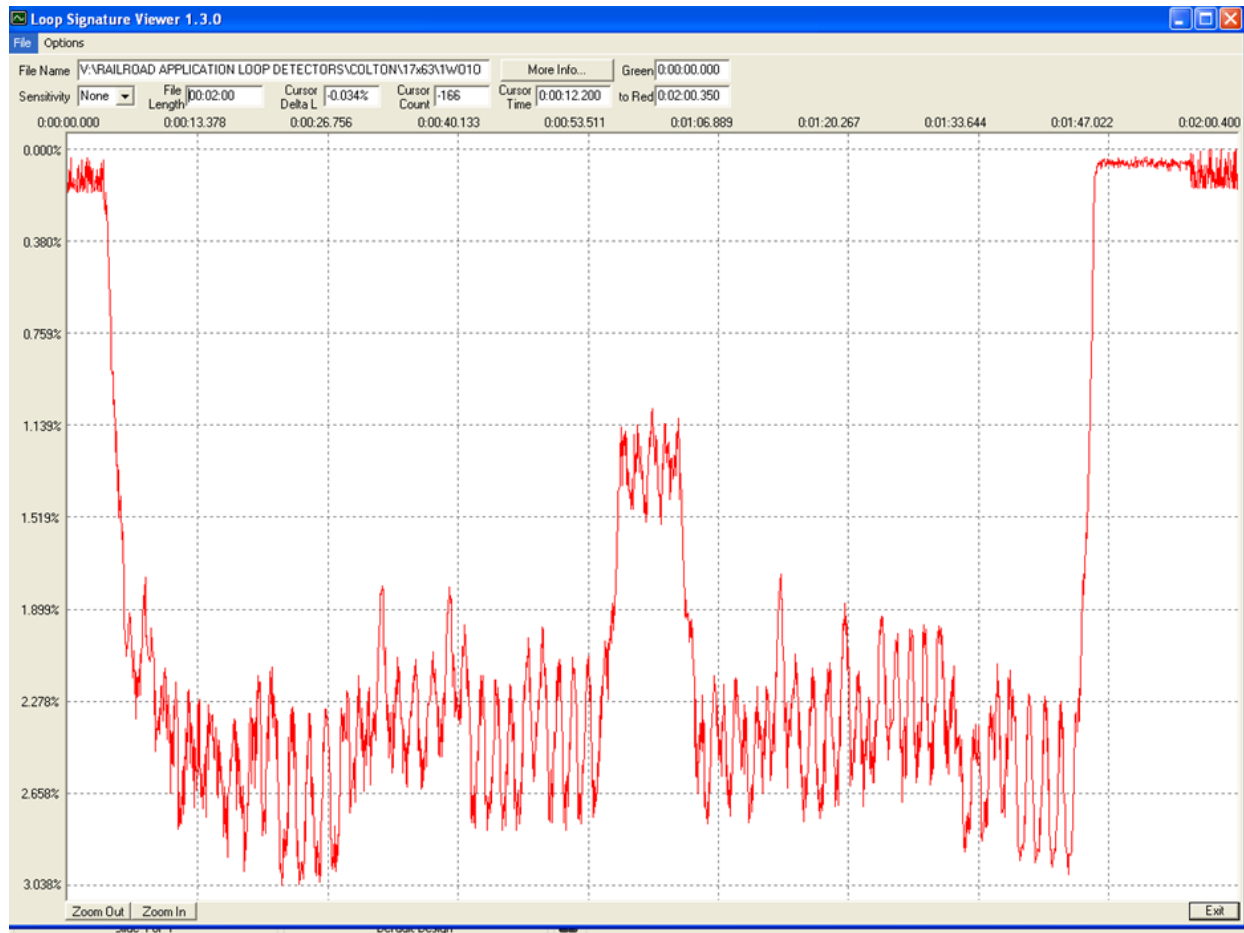
- The decreased inductance causes the resonant frequency to increase from its nominal value.
- If the frequency change exceeds the threshold set by the sensitivity setting, the loop processor will output a detect signal.



Inductive Loop Theory – How an Inductive Loop Detects a Train



Inductive Loop Theory – How an Inductive Loop Detects a Train



Detection of Vehicles on a Roadway

The single biggest drawback of an inductive loop?

The wire in the roadway.



Detection of Vehicles on a Roadway

The single biggest advantage of an inductive loop?

The wire in the roadway.



Detection of Vehicles on a Roadway

Why?

The wire, which establishes the detection zone, can not move or change position.

It is not impacted by environmental conditions.

It is not “shadowed” by vehicles in adjacent lanes.



Detection of Vehicles on a Roadway

Why?

Because the loop system can perform a self-check function.

Self-check is essential to any safety critical system – it has to legitimately simulate the object to detect and then verify that the object is detected during the self-check cycle.



Inductive Loop Theory

Self-check is not redundancy.

Redundancy can improve reliability, but can not establish vitality.

For four quadrant gate applications, 99.99% is not good enough.

Why?



Inductive Loop Theory

If the vehicle detection system fails to detect a vehicle in a four quadrant system, the vehicle may be “trapped” between the entrance and exit gates.

Adding delay time to the exit gates is not a solution either as it merely increases the opportunity for a motorist to enter the crossing.

The whole point of a four quadrant gate system is to close the crossing as quickly as possible.

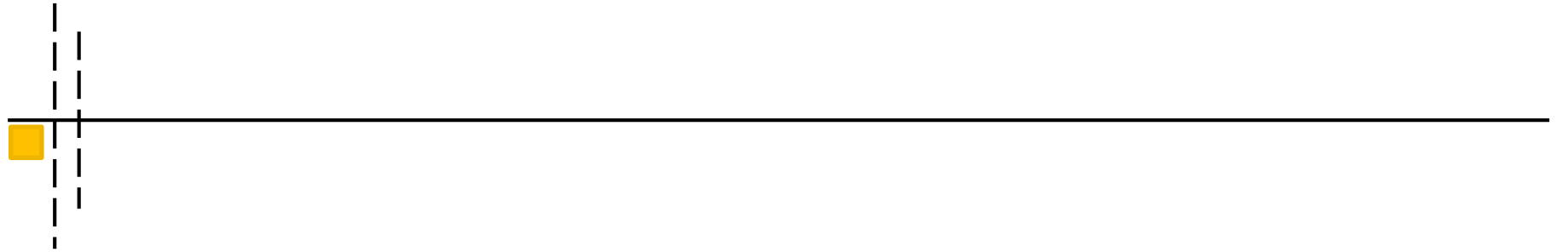


Inductive Loop Theory

With care, the negative effects of the wire in the roadway can be reduced significantly.

- Proper wire insulation
- Reliable splices
- Embedded loops in the roadway



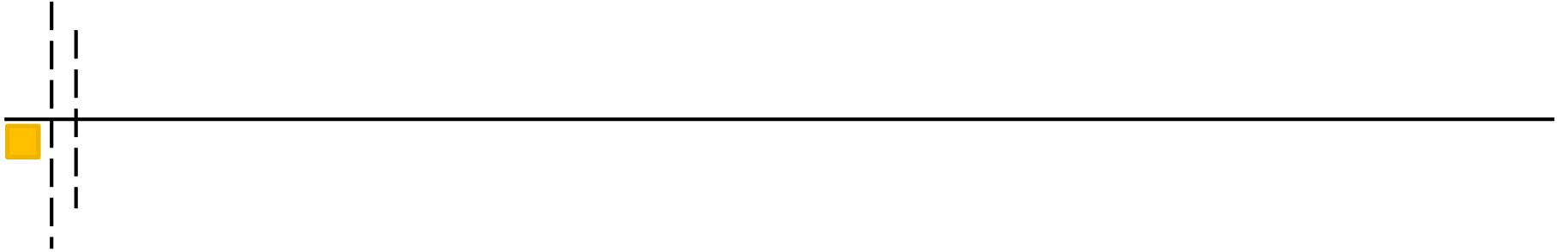


4 Quadrant Gate Roadway Application









4 Quadrant Gate Roadway Application





876

METROLINK

METROLINK

130

CLEAR
KEEP

RAILROAD
CROSSING
3
TRACKS

RAILROAD
CROSSING
3
TRACKS



RAILROAD
CROSSING
CRO ROAD

RAILROAD
CROSSING
CRO ROAD







RAILROAD
CROSSING
2
TRACKS

RAILROAD
CROSSING
2
TRACKS

W. 11th St

ONE WAY



Saving lives one crossing at a time

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