



UPR/MIT/TU Professional Development Program  
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## **Executive Summary**

# **Use of Preemption Systems to Bring Preferential Treatment to the Tren Urbano Plazas Vehicles**

by

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# Executive Summary

## Introduction

The Tren Urbano Plazas (TUP) will offer a collective transportation service, by buses or vans, where the users will have the option to be transported from the TUP to the Tren Urbano station (TU) or vice versa. One of the factors for the TUP success will be the quality of the transportation service that will be offered. The transportation service should be frequent, efficient, conveyable and quickly.

The Tren Urbano Plazas vehicles (TUPV) will be submitted to delays due the traffic signals (semaphores). The delays will retard the TUPV in a manner that may not fulfill the schedule.

The preferential treatment of the TUPV in the intersections holds the potential to reduce the delays due to the traffic signals. The preferential treatment will be carrying out by equipping the select intersections and the TUPV with a Preemption System. The Preemption System allows the communication of the TUPV drivers with the traffic signals controller at the intersection to temporary alter its phases and bring a preferential treatment (Advantage (low) priority or priority level 2) to the vehicle, which will be granted the right of way. Once the TUPV passes through the intersection the Preemption System returns the traffic signals to normal operation.

## Objectives

- Define the concepts related with the Preemption System.
- Explain the process by which the Preemption System will give a preferential treatment to the vehicles.
- Understand the functioning of the different Preemption System components.



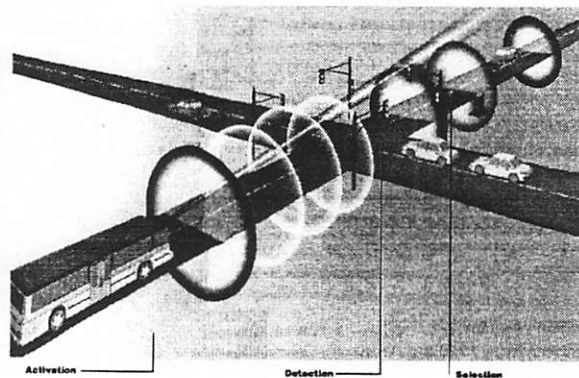
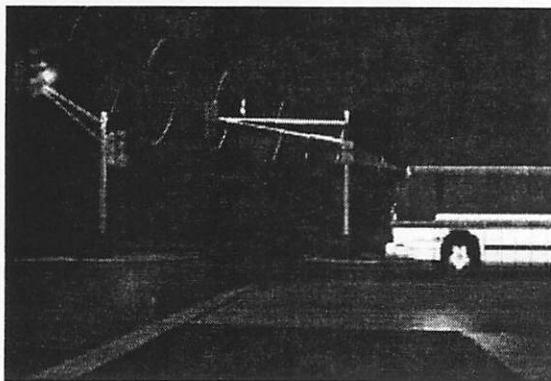
- Evaluate the effectiveness of the implementation of the Preemption System on the Tren Urbano Plazas vehicles.
- Illustrate by computer simulation the use of the Preemption System in an intersection where the Tren Urbano vehicles will pass.

### Preemption System

- Temporary alteration or adjustment in the normal operation of the phases and times of the traffic signals in a manner that provides preferential treatment to certain vehicles.
- Can be preformed by extending the green phase or truncating the red phase to do the movement of the vehicle through the intersection.

### Principal Components of the Preemption System

- Emitter → Its placed on the vehicle
- Detector → Its placed on the intersection
- Receptor → Its placed in the traffic signal controller at the intersection



### Functioning of the Principal Components

#### Emitter

- Its activated by a switch
- Emit an unidirectional encode signal



## **Detector**

- Receives the encode signal
- Decode the signal

## **Receptor**

- Activated the pre-programmed sequence of phases to be use over the preferential treatment period.
  - Extend green time
  - Reduce red time
- Priority within each level: First-come, first- served

## **Studied Preemption Systems**

- **Opticom**

Minnesota Mining and Manufacturing Company (3M)

### **Optical Emitter**

- Infrared optical signal
  - Transmission range up to 2,500 feet with a clear lens and up to 1,800 feet with a visible light filter.
  - Send an advantage (low) priority signal that carries the vehicle class (10) and ID number (10,000) information.

### **Optical Detector**

- Converts the decode signal to an electric impulse.
- Designed configurations in one direction and two directions.

### **Phases Selector or Discriminator**

- Process the electric impulse



- High priority will always override low priority.

- **EMTRAC**

ECONOLITE Control Products, INC.

**Transmitter**

- Its placed in the vehicle.
- Manual Operation → The driver indicates the desire direction of preferential treatment through the intersection.
- Automatic Operation → The desired direction of preferential treatment through the intersection is indicated automatically by an auto-compass.

**Transmitter Antenna**

- Radio signal.
  - Digitally-code spread spectrum radio in the UHF band.
  - Range of transmission programmable from 200 feet up to 3,000 feet.
  - The signal carries the desire direction of preferential treatment, the priority level (level 2 = non-priority vehicles), the vehicle ID number information and an optional password.

**Receiver Antenna**

- A single antenna shall be used per intersection for all vehicle approaches.

**Receiver**

- Process the radio signals programmed for each one of the four approaches.
- Priority level 1 (priority vehicles) will always override priority level 2.

