

# ClassGard

Make sure that you are collecting the right toll.

*Automatic Vehicle Classification (AVC) provides a way of independently verifying the class of the vehicle which in turn allows the toll agency to audit the toll collector in a manual lane and the tag class in an automatic lane. At the same time it provides excellent vehicle separation and hitch detection along with accurate license plate camera triggering.*

## Correct Fare Collection: The Problem

In most toll systems fare collection is based on the class table that was created as a part of the funding process for the toll system. In order to protect the fare collection process, toll systems must be able to automatically determine the class of each vehicle and its associated fare. This serves to assist the agency in auditing the fare collection process, be it manual or automatic.

## Automatic Vehicle Classification: The Solution

ClassGard is a total solution for the classification of vehicles into a customer defined set of vehicle classes. The system design is flexible and able to be modified easily to accommodate the data from additional sensors. The combination of a tracking laser (Scandar) with an overhead laser profiler provide for tracking of the vehicle and for the generation of excellent vehicle profiles. The addition of an axle detector detects the existence of axles and when combined with the tracker, generates the location of the axles relative to the front of the vehicle.

A unique set of classifier algorithms sort the profiled vehicles into a set of classes. These classes are easily modifiable to meet unique customer requirements. TDS has developed a design tool to allow for fine tuning of the classification algorithms.

If laser axle detection is implemented, the system can be completely non-invasive. Further it provides excellent vehicle separation for the toll system and can generate very accurate triggers for the image collection associated with violation enforcement.

A dual tire detector using fiber treadles can be added to the design if dual tires are a factor in calculating the toll amount. Weigh in Motion sensors can be added to the design in those cases where the toll amount is dependent on the weight of the vehicle.

- Highways, Bridges
- Tunnels. Ferries

- Adaptable Design

- 99.5% Nominal Accuracy

- Up to 64 Configurable Classes

- 0 to 60 mph (Stop & Go)

- Plate Reader Triggering

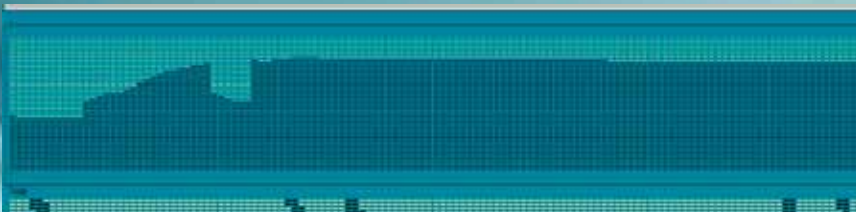
- COTS Equipment

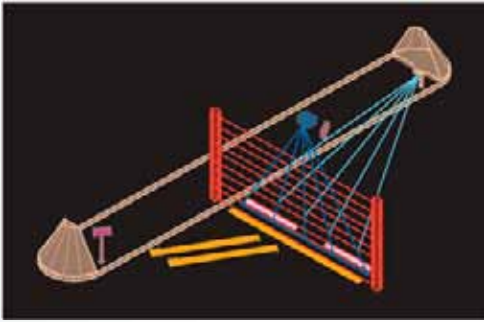
- Software Tool for Class Design Proofing

- Ethernet/RS-422 I/O

- Manual/Auto Lanes

- Independent Host I/O





## ClassGard System Operation

Data from the profiler is used to form a matrix depiction of the vehicle as seen from the overhead position of the laser. The vehicle detection process is initiated when careful examination of the profiler output indicates the presence of a vehicle. When the profiler is penetrated, the processor uses velocity information from the tracking laser (Scandar) to determine the position of the vehicle relative to the initial location point set by the profiler. From this information a vehicle profile is generated.

### Basic System Elements

- Laser Profiler
- Laser Tracker (Scandar)
- Axle Detector (Treadle or Laser)
- AVC Controller

### Optional Elements

- Dual Tire Detector
- WIM Quartz Strips

### Software

- Sensor Interfaces
- Vehicle Tracking/Separation
- Vehicle Profiling
- Vehicle Classification
- Lane Controller Interface
- Camera Triggering
- System Status
- Class Simulation

### Vehicle Classification Features

- Axle Locations
- Length
- Height Profile
- Width Profile
- Speed
- Special Characteristics

### Special Detection

- Hitches
- Forward or Backward Motion
- Vehicle Backouts

The real time flow of data from a treadle or a side mounted laser scanner provides for the determination of axle distances from the front edge of the vehicle. The length of the vehicle is determined from the number of individual data sets that are recorded. A treadle based dual tire detector can also be added to the system in the event that dual tires play a role in the classification scheme. A second overhead profiler is added if accurate width information is required for the classification process.

From the above information the class of the vehicle is determined. A sample class table is shown below.

**Sample Class Table**

Vehicle Type	Class
Small 2 axle vehicles except for van	1
(Class 2 + 1 axle trailer)	2
(Class 2 + 2 axle trailer)	3
(Class 2 + 3 axle trailer)	4
Large 2 axle vehicle except for bus	5
(Class 6 + 1 axle trailer)	6
(Class 6 + 2 axle trailer)	7
(Class 6 + 3 axle trailer)	8
Van	9
Two axle bus	10
3 axle vehicle except for bus	11

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