

QUANTUM

THE POWER BEHIND VEHICLE CLASSIFICATION

The team behind Quantum have been designing, developing and installing Automatic Vehicle Detection and Classification (AVDC) systems around the world since 1996. Quantum is a second generation AVDC solution designed as a comprehensive multi-sensor integration platform.

Tolling Technology

At the heart of a fully integrated AVDC solution sits Quantum, connecting the detection, classification, customer identification and enforcement sensors into a single unified system.

Our detection and classification solutions serve integration partners who use Red Fox ID technology in large-scale ITS projects including electronic toll collection, open road tolling, express toll lanes and advanced custom detection and classification solutions. With more than 1260 lanes committed, Quantum is a field proven, reliable and flexible AVDC solution.

One AVDC solution, multiple sensing options, greater design flexibility, lower risk to market.

With a view toward the long-term success of its customers, Red Fox ID supplies operationally-proven solutions and works closely with system integrators and road operators to ensure that they extract the maximum value from their intelligent transport system.

A single product processing data from loops, LiDAR's and piezos allows system designers greater flexibility in meeting their design goals than ever before. Integrating sensors in this way increases the overall effectiveness and accuracy of the whole system. Plate capture rate is increased to that of the AVDC detection rate, tag correlation to vehicle is more accurate resulting in fewer customer complaints, vehicle tracking through the zone is improved resulting in greater accuracy, resilience to sensor failure is enhanced. Quantum bases its decisions using all of the data that is available allowing a new generation of flexible, resilient systems to be designed resulting in increased toll yield to agencies and road operators.

Accuracy & performance

QUANTUM

LIDAR | LOOP | HYBRID

Detection accuracy¹
up to 99.96%

Axle classification accuracy¹
up to 99.9%

Dual tyre detection accuracy
98% or better

Shape classification accuracy²
up to 99.5%

Length¹
+/-5%

Speed¹
+/-5%

Accuracies apply to stop&go, tailgating and free flow traffic and all weather conditions.

¹ all vehicle types, including motorcycles

² for a typical 5 class simple shape table (m/c's, car, van/pickup, truck, semi-trailer)

Detection & Classification Solutions

Quantum integrates different sensing technologies together allowing system designers to develop efficient solutions for single lanes, express lanes and multi-lane free-flow systems. Quantum scales from simple single lanes with no upper limit to the number of free-flow lanes that can be processed simultaneously.

QUANTUM **LiDAR**

The addition of advanced solid state LiDAR designed for safety critical applications to the family of sensors supported by Quantum allows system integrators to prepare profile based fully overhead detection and classification tolling solutions. The chosen units have a long life, industrial class temperature range and are compact in size, thus requiring a minimum of gantry space.

- Single lane, Express Lane, Multi-lane Free-flow
- Self illuminating
- Efficient redundant designs
- Above ground
- Advanced tag correlation
- No rebar or poor quality pavement issues
- Reversible lanes
- Operates in all weather conditions
- Solid state or MEMS only
- Shape based classification
- Single¹ or dual gantry

¹subject to design review

QUANTUM **LOOP**

The staple of numerous toll zones throughout the world, loops provide a reliable and predictable sensor when used as a vehicle detector.

Red Fox has taken the standard main loop arrangement and made it better! Loops are no longer required for axle detection resulting in much improved accuracy, and our patented loop arrangement addresses traditional issues such as stop&go traffic and tailgating.

- Low in-service maintenance
- Mature technology
- Narrow loops for increased tailgate accuracy and m/c, with side-by-side, detection
- Automatic loop gain adjustment
- Advanced tag correlation
- Accurate front and rear trigger messages¹
- GUI based real-time detector tuning tool
- Reversible lanes
- Dual and single gantry designs supported
- Operates in all weather conditions

¹Raises camera image capture to >=99.96%

QUANTUM **HYBRID**

Quantum HYBRID combines multiple sensor technologies (loops, piezos, LiDAR) affording system designers greater flexibility in meeting customer specifications. A mixed sensor solution (loops and LiDAR) provides two independent detection and classifications systems for high redundancy systems.

A hybrid overhead system for axle class tables can be constructed using overhead LiDAR for the detection, tracking and classification and a minimal in pavement axle sensor for axle detection. Such a hybrid system is capable of supporting the standard FHWA 13 class table (this includes dual tyre detection).

Quantum HYBRID provides a safe migration path from axle based classification to overhead shape based classification systems with fully quantifiable revenue risk.

- All of the features of Quantum LiDAR and Quantum Loop
- Dual technology redundant designs
- Enhanced accuracy loop designs (improved motorcycle detection)
- Axle classification (single and dual) with minimal in-pavement installation
 - Plain axle, FHWA with dual tyres
- Provides a safe migration path from axle based classification to overhead shape based classification systems with fully quantifiable revenue risk.²
- Single¹ or dual gantry

¹subject to design review

²Contact Red Fox ID for further details

Quantum Replay

Quantum Replay is an offline replay simulator, ideal for testing and verifying changes to class tables or configuration files or for using as a data source for lane controller testing.

This powerful tool uses the configuration set and live data captured from a production site and replays the events in real time. Engineers can use Quantum Replay as part of their development process and later as part of their regression test system. Site maintenance engineers can also use the same tool to replay events as part of their fault investigation process.

Quantum Replay is installed on a user's laptop or desktop computer and is licensed on a per project basis. Using virtualisation technology allows the tool to be used on Windows or Linux systems.

MOMS Integration

Quantum continuously tracks and records status and fault data which is stored into a local database. Key data is made available via a dedicated Fault and Status network socket. The system supports both a 'store and forward', sometimes known as 'push', or a 'store only' with an API to access the data, sometimes known as a 'pull'. Quantum uses the performance data to make small adjustments to internal parameters based on a real-time analysis of traffic and environmental conditions to ensure optimal system performance. Parameters falling outside of an accepted range will be recorded in the fault and status database.

Common features

- Vehicle start and end times
- Intermediate progress messages
- Unique, non-repeating, transaction ID
- Width, length, roof height, maximum height, speed
- Lateral location in lane (better ALPR camera trigger decisions)
- Predictive rear trigger
- Accurate front and rear trigger messages¹
- Wrong way indication
- Over height immediate alarms
- Axle count, location, weight, dual tyres²
- Correlated tag data
- Unique ID, lane ID, class
- Relative weight in motion (Quantum LOOP & Quantum HYBRID)
- Host integration simplified with virtualisation technology
- Height over or between nominated axles³
- Volume⁴
- Degraded Mode

¹Raises camera image capture to >=99.96%

²Superwides coming soon

³Classification input

⁴Requires LiDAR

Rules Engine

The flexible and configurable Quantum Rules Engine allows sophisticated custom class tables to be mapped to Quantum via an external configuration file. This system is designed to support a wide variety of customer class tables based on the processing of the inductive and shape profile, the detection and position of axles on the vehicle and the height (max and roof), width and length of the vehicles passing through the detection zone. Expressed in the form of a meta-language the Rules Engine provides robustness over time by requiring only simple configuration changes to fine tune the boundary cases as opposed to new code releases and the ensuing lengthy testing cycle.

Quantum is the registered trademark of Red Fox ID Limited. Other trademarks are the property of their respective owners.

The Quantum system is subject to the following patents:

UK 2536028, USA 10109187. Mexico Patented MX383369. Patented CN ZL201680026081.X.

Further applications pending.