

ACCURATE PASSENGER AND PEOPLE COUNTING WITH STEREOSCOPIC VISION TECHNOLOGY

Whitepaper

OVERVIEW

New technology is changing the transportation industry at a rapid pace, improving the ride for passengers and simplifying management tasks for transit operators. Passenger counting in particular has been a tedious process in the past. Going back to the start of the transportation industry, drivers were required to count passengers manually – an inaccurate and nearly impossible feat considering all of the other tasks at hand. Although technology has advanced to light sensors, infrared curtain sensors and thermal imaging, these legacy systems still fail to account for the diverse nature of transit vehicles and passengers.

Passengers may be tall, short, or average height; in wheelchairs, walking slowly or moving quickly; seniors, young adults, students, or children. Some vehicles have wide doors while others have more narrow doors. Some routes have heavy traffic with standing room only. Many sensors simply cannot handle these diverse situations. Add in multiple fare zones, free fares, and intersystem transfers, and one can see why advanced technology is necessary to ensure accurate passenger counting and fare collection in today's transportation industry.

Automated vision-based passenger counters connected to a database through a wireless

connection will more accurately count passengers today, leading to better budgets, schedules, and an improved customer experience.

THE LATEST IN PEOPLE AND PASSENGER COUNTING TECHNOLOGY: STEREOSCOPIC VISION TECHNOLOGY

The latest in people and passenger counting technology is the Eurotech DynaPCN 10-20, a compact device based on non-contact stereoscopic vision technology specifically designed for accurately counting individuals entering or leaving public transport vehicles such as trains, metros or buses.



Eurotech's People / Passenger Counter

Clearly, the most important feature for a passenger counter is accurate counting. A good

design must be smart and flexible enough to account for variations such as passenger height or several passengers boarding simultaneously. The DynaPCN 10-20 achieves high accuracy with two stereoscopic cameras and four high luminosity infrared diodes.

Stereoscopic cameras capture images of the area below the device and instantly analyze the data in real time through a sophisticated algorithm. The algorithm analyzes the height, shape and direction of any objects that are passing through the field of view. Instead of needing an entire body to pass through the view of the camera to count, these advanced cameras can count from just a shoulder or part of the body, greatly reducing the margin of error.

When the device determines that a person is entering or leaving, the incoming and outgoing counters are incremented accordingly, along with time information. Time-stamping the passengers provides additional metrics to plan and route for more efficient use of the fleet.

Using cutting-edge passenger counting technology, the DynaPCN 10-20 achieves a real life operating accuracy of 97 percent.

FLEXIBLE MOUNTING

The DynaPCN design provides an easy and unobtrusive mounting flush in the ceiling space above a doorway and can be adapted to different roof and door styles. The angle of the optical panel can be adjusted; therefore, it can be placed in different positions and on non-horizontal surfaces. Dedicated I/O lines for door sensor connections and easy integration for multiple units makes installation simple in any type of transit vehicle.

As Eurotech's automatic passenger counter has evolved, it has become more flexible in how high it can be mounted in relation to the width of the gate. Gates up to 6 feet wide now only require one DynaPCN to monitor the passage, with the DynaPCN mounted at least 6.5 feet high. Previous versions of the product required two linked counters for a 6-foot opening, but further software development takes the images from two cameras within a single unit and compounds them to rebuild a 3D image.

ROBUST DESIGN

People and passenger counters must be able to withstand a wide range of severe environmental conditions. Brightness and other factors can lead



to false metrics in various counters on the market today. The DynaPCN is specifically designed for mobile environments and has been tested against extended temperatures and severe vibration levels, allowing integrators to deploy the system in harsh transportation conditions. In order to offer accuracy across the lighting spectrum, the DynaPCN uses an integrated high luminosity infrared LED system that can operate in any type of lighting and environmental condition, even complete darkness.

The DynaPCN features digital I/O interfaces that communicate directly with intelligent doors or flow control systems, guaranteeing the best counting performance. For instance, the digital inputs can be used to detect when a door is open or closed and then stop or start the counting process accordingly.

POWER – OVER – ETHERNET (POE) CONNECTIVITY

The DynaPCN offers a RS485 connection, and as technology evolves on transit vehicles, more vehicles throughout the world have other services using an Ethernet backbone such as onboard entertainment systems. Featuring Ethernet connectivity, the DynaPCN 10-20 can be easily and quickly integrated with an on-board unit that is

already available. The system offers Power over Ethernet (PoE), which passes electrical power along with data on Ethernet cabling and simplifies installation and design constraints when deploying the DynaPCN in the field. The ability to add IP addresses also allows for remote configuration, management and upgrade support. The RS485 connectivity option offers flexibility for the DynaPCN particularly in other applications beyond transportation, such as retail.

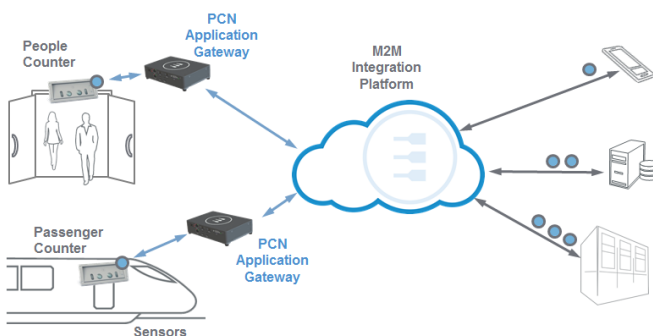
SAMPLE APPLICATIONS FOR THE DYNAPCN

A passenger counting system based on the DynaPCN can benefit both bus and rail operators and passengers alike. Passengers can enjoy real time information such as seat availability or route planning. Operators can verify fare collection figures with accurate passenger counts and validate passenger counts to justify payments due to transportation companies. In addition, the system can be extended to schedule maintenance based on vehicle usage, to optimize vehicle loads across regions or time periods, and to monitor service quality.

The DynaPCN can be deployed in a host of other applications such as:

- Optimizing taxi availability

- Detecting fraud in public transport
- Increasing efficiency through fleet management and scheduling
- Analyzing attendee patterns at conferences
- Restricting the number of people in a location for safety
- Analyzing traffic flows in cities



People / Passenger Counting Application

One unique DynaPCN use case involves a retail owner who wanted to measure the performance of franchise retail locations within a chain. The DynaPCN was deployed and connected to Eurotech's Everyware Device Cloud to easily access data. The customer was able to correlate the number of people entering the various locations to the number of transactions completed

to understand the successes or issues each location faced.

Another innovative application involves restroom cleaning. Rather than cleaning restrooms on an arbitrary time schedule, one customer used the DynaPCN to count restroom users and perform more efficient maintenance based on the number of visitors, resulting in an improved customer experience and better use of cleaning resources.

In addition to the DynaPCN 10-20, Eurotech offers smart connecting solutions through its M2M gateways. These multi-service gateways inherently provide full software support for integrating the DynaPCN 10-20 through Eurotech's Everyware Software Framework (ESF) and connecting the data to the Everyware Cloud or other business applications.

For further information on Eurotech products and solutions, please visit www.eurotech.com or send an email at sales@eurotech.com.

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