# TIMEKEEPER®
## BY EFACEC

The users of the public transportation systems are increasingly demanding a high quality service measured by important factors as the headway and punctuality, the global comfort during the journey and at the stations, the accurate and on-time information to the passengers and, more important, their safety.

Aware of this reality, with the aim of achieving modern tools for the efficient management and operation of customer services, Efacec developed an advanced Fleet Management System /Operations Support System (OSS) solution - the TimeKeeper by EFACEC ® application.

The TimeKeeper by EFACEC ® comprises two components: one at the Operational Control Centre (OCC), and the other on board of the vehicles. These two components communicate through a radio communication network, allowing the OCC to receive in real-time from the on-board equipment information about its location, service status and occurrence of technical and safety alarms.

From the information received at the OCC it is possible to implement strategies to maintain the service regularity (schedules and frequencies), optimizing the resources (vehicles, drivers and fuel/energy) and minimizing the effects of network disturbances (traffic congestion, accidents, failures, etc). On the other hand, accurate information on the transport availability is given in real-time to the passengers, through different media: public information equipment, company's website, SMSs, smartphone app, etc.

To improve safety and reduce energy consumption, the application is permanently monitoring the vehicle current speed and if speed limits are not respected, the driver on-board the vehicle and the regulator in the OCC are informed in real-time. Several levels of speed alarms may be triggered. The most severe one may be configured to automatically send a brake order to the vehicle and stop it.

The analysis of different reports made available by TimeKeeper by EFACEC ® application is an important tool for the operational planning of activity, service quality and management of the available resources.

## Benefits

- Satisfaction of the client/user (better information system / added security level);
- Higher level of service regularity and schedule adherence provided by automatic system monitoring and corrective actions that can be performed in real-time;
- Automatic and computerized registry of the achieved vehicle timetable, its position, occurrences and service statistical data, avoiding manual procedures;
- Reduction of on ground crew to manage vehicle circulation at terminal stations (control passes to be managed in a centralized way);
- Enhanced safety onboard the vehicle by sending automatic brake requests in case speed limits are exceeded;
- The vehicle maintenance process benefits by knowing in advance the current alarms and km of each vehicle which are reported even before the vehicle reach the maintenance / repair shop.



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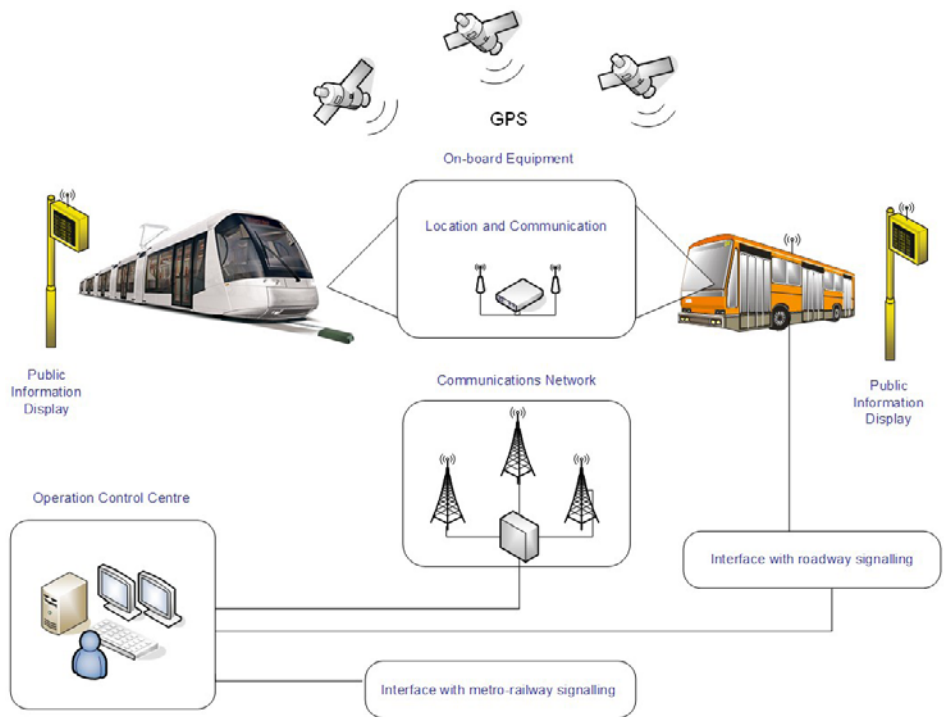
# Domain of Application

TimeKeeper by EFACEC ® application is an essential tool for public transport companies, leveraging the actuation in 4 essential domains:

- **Quality of Service /Visibility**, not only due to the reliable and credible information it provides (reducing the user's waiting time), and to the improvement of regularity and schedules adherence achieved, but also due to the highest safety to its clients and staff, contributing to greater competitiveness of the public passenger transport;
- **Productivity**, through a better resources rationalization and the optimization of the service offered, allowing a more efficient resource planning and management;
- **Efficient Transport Management**, as it is an important information source for the traffic control systems;
- **Maintenance**, by receiving real-time status information and daily report of the technical alarms of the vehicles.

# System Architecture

The complete system consists of:

- On-board equipment including on-board computer and driver's console with TimeKeeper by EFACEC ® software, location device and radio terminal;
- Location system;
- Communication network;
- Public Information equipment;
- TimeKeeper by EFACEC ® application at the Operational Control Centre (OCC).

# On-board Equipment

The main functionalities of the on-board equipment, which includes a powerful on-board computer and an advanced polychromatic touch screen driver console, are:

- Location of the vehicle;
- Radio communication with the OCC (voice and data);
- Interface with driver and other on-board subsystems (ticketing, passenger counting, public information, signaling, video surveillance, speed control...);
- Vehicle state monitoring (location, kilometric performance, load, speed, failures, etc.);
- Service state (advance/delay, commercial km, ride time, etc.);
- Crew identification and state (driving time, crew replacement records);
- Security (real-time alarm communicated to the OCC and images recording in case of accident, robbery, vandalism, etc.);
- Display recommended speed profiles to be followed and send brake orders if speed limits are not respected;
- Passengers information (visual and sound).

The on-board equipment to be installed in the vehicles is certified according to the standards and regulations required for the demanding railway applications, including the EN 50155 standard.
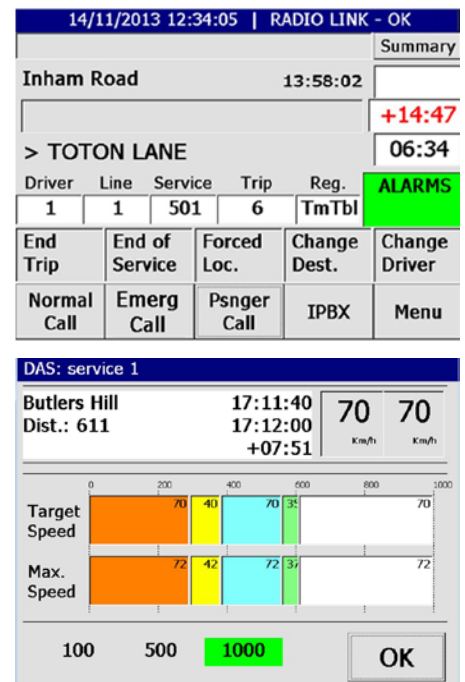


# Location System

The vehicle location system can be based on GPS (more used in buses) or RFID beacons (more used in tramway systems), complemented with other existing equipments (odometer, door sensors, reverse signal, active cabin).

The on-board computer of the TimeKeeper by EFACEC ® application, using the base information above, transmits regularly to the OCC the vehicle location, allowing the regulators at the OCC to know the vehicle location in real- time.

# Communications Network

The communication network supporting the TimeKeeper by EFACEC ® application can be implemented over TETRA networks, GSM/GPRS, 3G/4G/5G, Wi-Fi or a combination of different technologies.

# Passenger Information System

The TimeKeeper by EFACEC ® application automatically updates the information of the targeting passenger information (visual and sound) equipment, on stations/stops or on-board the vehicles.

Information about services availability, vehicle arrival estimations and destination is given and shown in real- time. Perturbations and other on-demand information can also be displayed and broadcasted on the designated displays and announcement equipment.

# The Operational Control Centre

The TimeKeeper by EFACEC ® application at the OCC is the central core of the whole operations management support system, supporting the following operational management activities:

- Real-time operation management;
- Regulation and circulation management;
- Alarm management;
- Incident management;
- Public information;
- Statistical data analysis;
- Integration with other systems of the company and with external systems like roistering tools, signalling infrastructure, road crossings management, video surveillance, business intelligent tools, etc.

The system operation takes place at the Dispatch Terminals, whose main functionalities are:

- Visualization of the synoptic lines;
- Real-time location representation of the vehicles and corresponding state in the line synoptic and map view;
- Visual and audible announcements to stations and vehicles through a georeferenced (SIGGIS) map;
- Monitoring the degree of compliance of the established schedules;
- Implementation of regulation actions to solve constraints;
- Temporary modification of schedules and routes;
- Voice and data communications with the driver and/or the passengers on -board the vehicle;
- Real-time visualization of operational data and alarms;
- Space-time graphics of the schedules (programmed and real).

The parameterization and extraction of reports based on the stored statistic data is done through Statistics and Configuration Terminals.

An integrated videowall system allows the users to visualize any screen of a terminal, an essential functionality to handle emergency situations.

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