

ITSCAMPRO

ITSCAMPRO

EFFICIENT VEHICLE AND DANGEROUS GOODS MONITORING

| Produto

Pumatronix Equipamentos Eletrônicos Ltda.

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Change History

Date	Revision	Updated content
08/02/2018	1.5.7	Initial Version
10/29/2021	1.8.0	ITSCAMPRO app for Android system
12/01/2022	2.0	Update of document layout, insertion of content for versions 1.8.1 to 1.11.2
02/19/2024	2.1	Content update for version 1.14.1
05/15/2025	2.2	Content update for software version 1.16.0 (SAD-825)
11/17/2025	2.3	Overview Update; Browser Specification Update

Overview

ITSCAMPRO is a system that performs optimized and efficient management of vehicle images, designed to receive a large number of images per second and allow the use of data science.

Using ITSCAMPRO, searches can be performed for one or more vehicle license plates, among all stored images. The plate models that the system can recognize include those of Brazil in the Mercosur, Argentina, Chile, France, Mexico, Netherlands, Paraguay and Uruguay standard. You can also import a list of plates of interest or manually register which ones should be monitored. From the list of monitored vehicles, different types of alerts can be configured to, for example, inform each type of legal restriction that the system can differentiate. The images stored in ITSCAMPRO are the data source for reporting on traffic volume, path time, origin and destination, among other information.

ITSCAMPRO represents the cutting edge in vehicle monitoring systems, using image analysis driven by state-of-the-art artificial intelligence algorithms. Its ability to manage events related to vehicle identification, whether through automatic license plate recognition (LPR) or general vehicle characteristics, positions it as a leading solution in today's technological outlook.

With the support of this advanced software, it is possible to set up inspection barriers, making a significant contribution to the effective inspection, monitoring and control of the entry and exit of vehicles in cities, providing an effective electronic fence. The system also stands out by issuing crucial alerts when it identifies vehicles that have been stolen, robbed, suspected of taking part in criminal practices, or with circulation restrictions, offering an agile and proactive response by enabling integration with public security systems such as: PM-MG, PM-PR, Detecta-SP, Alerta Brasil 3.0 / SPIA (PRF) and Sistema ONE. Audible and visual alerts and notifications can be received via the web interface or mobile app, or by e-mail.

The system can automatically submit all vehicle passages for a reading validation process. This process can validate the reading without human intervention, or the system directs the passages (if necessary) for manual review and validation, including REST API for integration with third-party software.

ITSCAMPRO enables detailed searches of traffic history and generates comprehensive statistical reports. These reports include information such as average speed between two points, travel time, comparison between origin and destination, providing not only better urban mobility, but also contributing to road safety.

In addition, it stands out for its unique ability to detect dangerous cargo (CARGO ID hired separately) on trucks or trailers, identifying the UN codes affixed to these vehicles, enabling strategic planning in the management of accidents involving dangerous cargo.

ITSCAMPRO is not just a monitoring system, but a complete tool for optimizing traffic management, strengthening safety and enabling proactive actions in critical situations. Its advanced, multifunctional approach makes it the definitive choice for the growing demands of vehicle monitoring in an increasingly dynamic and challenging scenario.

Handling Risks



Distribution of information: The content generated by ITSCAMPRO (captured images and information) is protected by user and password. However, it is up to the system administrator to control users who have access to information and the dissemination of content.



Plate reading: When ITSCAMPRO receives a license plate recognized as "000000", "" or when no data is reported, it is correctly set to empty.



Similarity Search Application: For image similarity search functionality, hardkey is required to be used, which limits the application to the number of image capture devices configured.



Software License: Software and related documentation are protected by copyright. By installing the software, you agree to the terms of the License Agreement.



System Restore: When restoring a database in ITSCAMPRO, all information that was stored on the equipment (including internal references to the images) will be overwritten.



Factory Restore: When you restore an ITSCAMPRO installation to the factory version, all information that was stored (including images) will be erased.



ITSCAMPRO Restart: Requesting ITSCAMPRO restart causes all connections to image capture devices to be interrupted while the server and service are re-established, and vehicle recognition may be lost during this period.



External image resolution: The external image in jpg format must have a minimum resolution of 800x600 (SVGA), so that it can be used by the comparison algorithm with sufficient information in the search for similar vehicles.

Models

ITSCAMPRO can be used in a variety of applications without performance impairment, provided that the installation specifications provided by Pumatronix are respected. These specifications vary depending on the size of the installation and the flow of vehicles analyzed.

ITSCAMPRO is a robust system that can be used in the standard way, or it is possible to hire customizations, from contact with the Pumatronix sales department. These customizations can modify the operation of the product or may include specific features, such as custom reports. In addition to the available software appearance settings, changes in visual identity can be made. More information about ITSCAMPRO customization can be requested directly from Pumatronix.

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1. Getting to know the product

When accessing the ITSCAMPRO System, the home screen configured for the logged-in user is displayed, such as the *Mosaic* screen, which contains the thumbnail images of the registers made in real time. These registers presented in the *Mosaic* panel come from all image capture devices to which the user has access. The restriction of access to equipment is a system feature, considering that the information stored may require confidentiality of disclosure. More details on the availability of information is available in [Access Control and Information Availability](#).

On the *Mosaic* screen, when selecting the image of an equipment, it is highlighted to the left of the mosaic (of varying format) and data identified in real time for the vehicle and its license plate, with a link to the license plate information page. Below the mosaic is the list of the latest detections of vehicles being monitored, which gives access to [detailed information of the register](#) made, using the icon in the left-hand column. This *Monitoring* list contains the data compiled from the *Security Panel*: date and time of capture, license plate identified, location and device that made the capture and the database of origin.



User interface: The availability of the ITSCAMPRO system's menus and functionalities corresponds to the *Profile* and *Access Groups* to which the logged-in user belongs, who may not have access to all the existing options.

The interface screen contains the menu bar and functions always visible and available for access, according to the logged-in user's *Profile*:

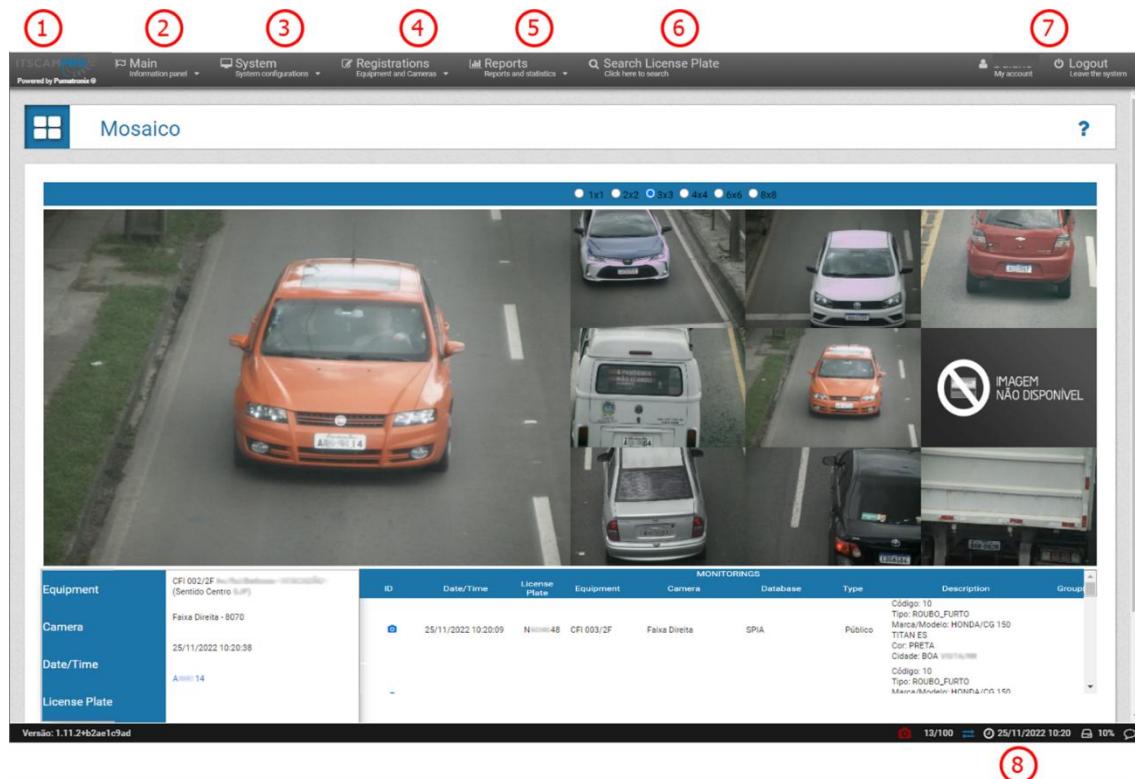


Figure 1 - Features available in the interface: 1) Access to the home page, 2) Main Menu, 3) System Menu, 4) Registration Menu, 5) Reports Menu, 6) Search License Plate Function, 7) User Account Data and Logout, 8) Status Bar

In the *Main* menu (2) are the panels with vehicles, traffic, and system information. In the *System* menu (3) are the options for managing access, settings, and the system maintenance process. In the *Registrations*

area (4) it can be incorporated the equipment that provides the image capture data to the system and the embedded devices authorized to connect to the system, list the groupings for COMPARE, register vehicles, stretches of road and dangerous cargo of interest on and create notifications to users.

The *Reports* menu (5) displays the information options that the system can generate. While a quick search for a vehicle (informing its license plate) can be done using the *Search License Plate* option (6). The logged in user and account and login settings are in the upper right corner of the screen (7). The *Status Bar* (8) shows the devices operating data, indicating if any are not communicating, which takes to the list of devices registered in ITSCAMPRO, using the capture device icon. The other data are the number of active sessions, the actual time connected, the current time and the free disk space, which displays the HD memory usage figures. The last icon on the right opens the *Notification Center*.

1.1. Help to Use ITSCAMPRO

The question mark symbol available on the ITSCAMPRO screens displays the help content on the left side of the screen containing a brief description of the screen functionality and further details on the parameters that can be configured, in which the system default values are indicated, In order to facilitate the adjustment process.

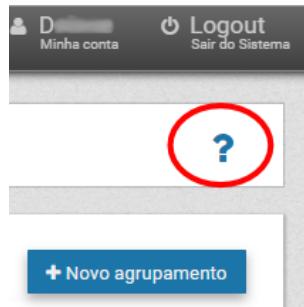


Figure 2 – Location of the ITSCAMPRO Help Symbol

1.2. Creating New Items

To the ITSCAMPRO several objects can be added, such as users, equipment, image capture devices, configuration profiles, monitored vehicles, among others. This feature is always available on the button with the "+" symbol.

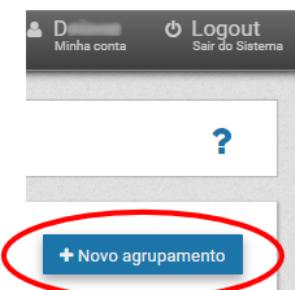


Figure 3 - Symbol for inclusion of items in ITSCAMPRO

1.3. Detailed View of a Register

When a vehicle is registered in ITSCAMPRO, more details can be viewed on the *Mosaic* screen, through the *Capture Report* or on the link available in the *Security Panel*. These details are organized in the tabs *Information*, *Statistics*, *CLASSIFIER*, *History* and *Renavam* and correspond to:

- Sequence of captured images, which can be viewed in full screen, enlarged or even copied;
- Number of the register generated in ITSCAMPRO;
- Vehicle License plate read automatically. If the user has permission to change the plate, an edit button is displayed next to it;
- Temporal information of image acquisition (date and time of capture);
- Spatial information (equipment and geographical location on the map);
- Information on the dangerous cargo code in vehicles that have this information (if the user has a license to use this functionality and is enabled for the equipment);
- Details about the detection of the license plate, such as the time taken for recognition, background color, country of the license plate model and whether it is a motorcycle license plate;
- Vehicle details identified with the CLASSIFIER (Species/type, Brand/Model and Color);
- History of changes in the register in the system (change in the characters of the plate);
- Option to delete the register, if the user has permission to remove the register;
- Access option to *Similarity Search*, when there is the COMPARE module installed in the system, available through the Magnifier button.

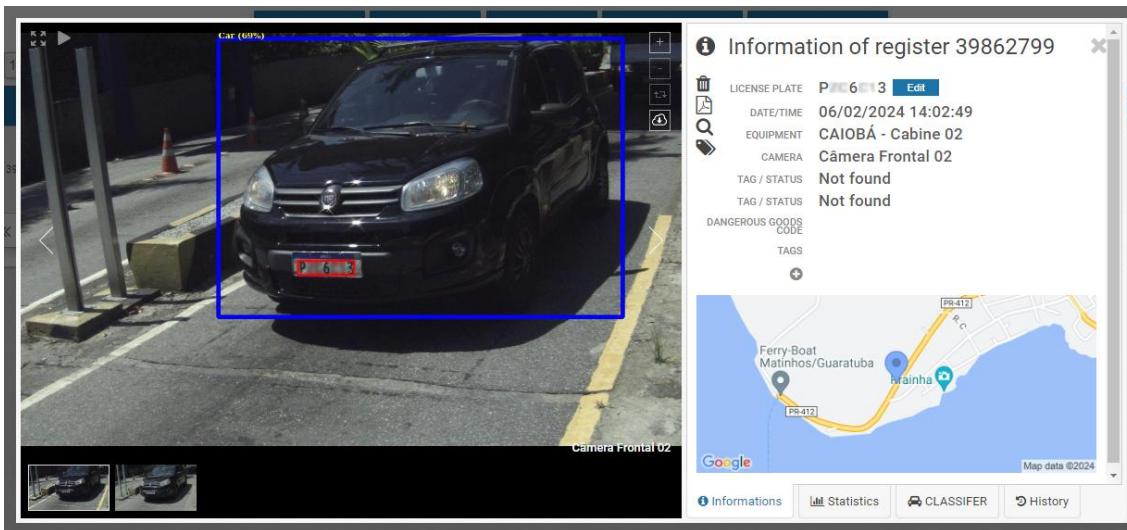
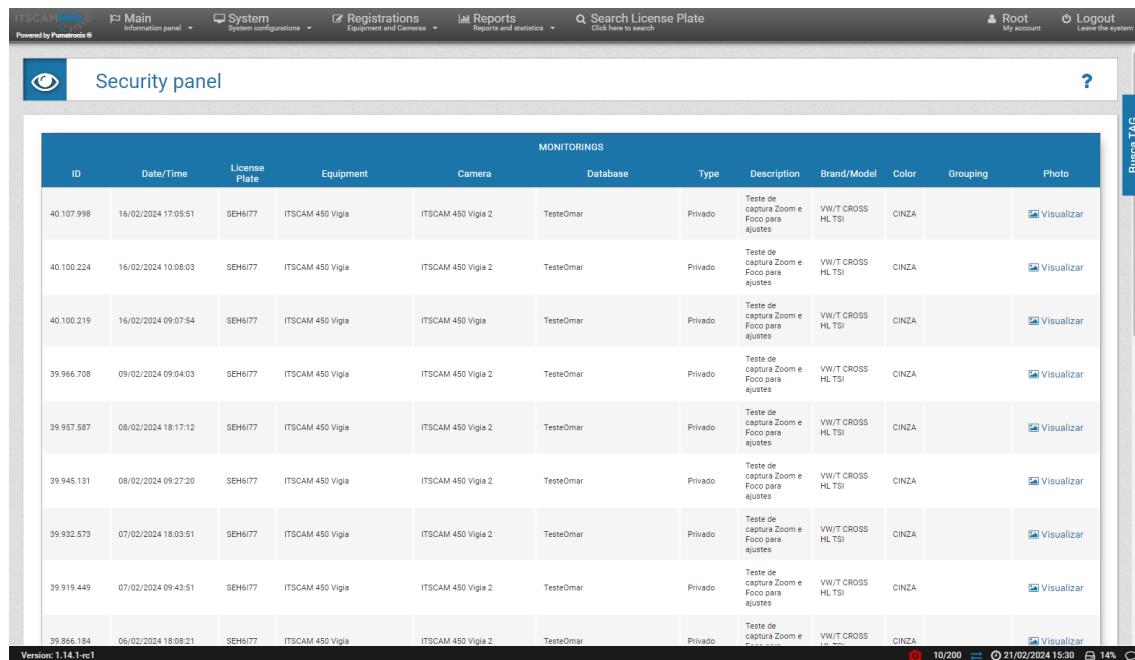


Figure 4 - Screen with detailed registration information

1.4. Security Panel View

Vehicle plates can be registered in ITSCAMPRO so that the system monitors automatically on associated equipment. When one of these monitored plates is identified, an alert will be issued by ITSCAMPRO, which can be in pop-up, audible, or email format. In addition to the alert, all monitored vehicle registers are organized in list form in the *Security Panel*. This means that this is the main screen for monitoring vehicles. However, the displayed registers are conditioned to the equipment released for the user profile that is connected to ITSCAMPRO.

The list with the registers informs the register identifier, date and time, the license plate of the vehicle automatically identified in the image, the equipment and device responsible for image capture, the *Database*, *Description*, *Make/Model* and *Color* referring to the registration in the database, *Groupings* associated with the vehicle's image and the possibility of checking the [images and register information](#), clicking on the *View* link to the right of the list.



ID	Date/Time	License Plate	Equipment	Camera	Database	Type	Description	Brand/Model	Color	Grouping	Photo
40.107.998	16/02/2024 17:05:51	SEH6177	ITSCAM 450 Vigia	ITSCAM 450 Vigia 2	TesteOmar	Privado	Teste de captura Zoom e Foco para ajustes	VW/T CROSS HL TSI	CINZA		
40.100.224	16/02/2024 10:08:03	SEH6177	ITSCAM 450 Vigia	ITSCAM 450 Vigia 2	TesteOmar	Privado	Teste de captura Zoom e Foco para ajustes	VW/T CROSS HL TSI	CINZA		
40.100.219	16/02/2024 09:07:54	SEH6177	ITSCAM 450 Vigia	ITSCAM 450 Vigia	TesteOmar	Privado	Teste de captura Zoom e Foco para ajustes	VW/T CROSS HL TSI	CINZA		
39.966.708	09/02/2024 09:04:03	SEH6177	ITSCAM 450 Vigia	ITSCAM 450 Vigia 2	TesteOmar	Privado	Teste de captura Zoom e Foco para ajustes	VW/T CROSS HL TSI	CINZA		
39.957.587	08/02/2024 18:17:12	SEH6177	ITSCAM 450 Vigia	ITSCAM 450 Vigia 2	TesteOmar	Privado	Teste de captura Zoom e Foco para ajustes	VW/T CROSS HL TSI	CINZA		
39.945.131	08/02/2024 09:27:20	SEH6177	ITSCAM 450 Vigia	ITSCAM 450 Vigia 2	TesteOmar	Privado	Teste de captura Zoom e Foco para ajustes	VW/T CROSS HL TSI	CINZA		
39.932.573	07/02/2024 18:03:51	SEH6177	ITSCAM 450 Vigia	ITSCAM 450 Vigia 2	TesteOmar	Privado	Teste de captura Zoom e Foco para ajustes	VW/T CROSS HL TSI	CINZA		
39.919.449	07/02/2024 09:43:51	SEH6177	ITSCAM 450 Vigia	ITSCAM 450 Vigia 2	TesteOmar	Privado	Teste de captura Zoom e Foco para ajustes	VW/T CROSS HL TSI	CINZA		
39.955.184	06/02/2024 18:08:21	SEH6177	ITSCAM 450 Vigia	ITSCAM 450 Vigia 2	TesteOmar	Privado	Teste de captura Zoom e Foco para ajustes	VW/T CROSS HL TSI	CINZA		

Version: 1.14.1-rc1

10/200 21/02/2024 15:30 14%

1.5. Traffic Panel View

ITSCAMPRO allows to register *Monitored Roads* considering an initial and a final equipment, the system starts monitoring and extracts statistical information on traffic between the indicated equipment on each stretch. These information are updated in real time in the *Traffic Panel*, accessing the *Time/Speed Graph* of the respective stretch. The traffic data in the stretch are the time spent to travel the stretch and the average speed estimate (the most detailed information can be obtained in the [Time and Speed Report](#)). The management of the monitored stretches by the equipment can be done through the *Registration* menu in the option *Monitored Roads*.

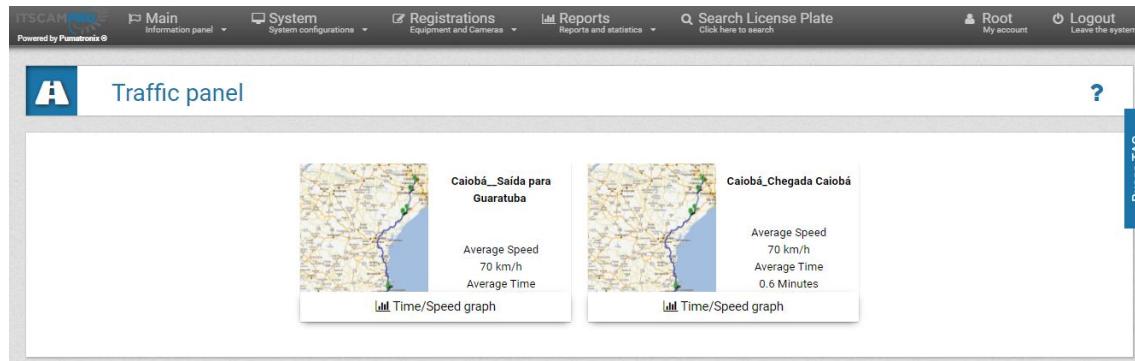


Figure 5 - Traffic Panel Home Screen

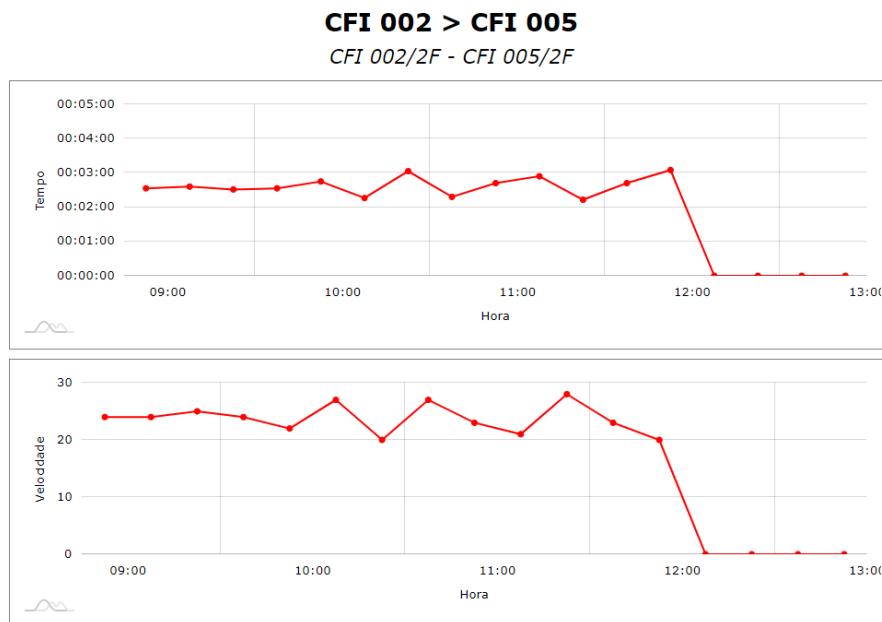


Figure 6 - Time/Speed Graph screen

1.6. Map Display

ITSCAMPRO may make available the display of registered devices or monitoring locations on a map, which considers the geographical position (latitude and longitude) of the registration. In this display, the equipment status is represented by the color of the icon, which indicates whether it is *Disabled*, *Operating*, *Failed on one or more cameras* or *No communication*.

At the top left of the visualization is the *Subtitle* button, which displays or hides the list of *Installed Equipment* and the *State of the equipment* caption, as well as the *Points of Interest* button, which displays or hides landmarks on the map. By clicking on one of the equipment listed, which is indicated with the color of the current state, it is located on the map and the characteristics are displayed, containing the name, geographical coordinates, and the list of corresponding capture devices, with the time that has passed since the last update. The type of device connected is identified by the icons displayed on the map, which can indicate:

- A mobile phone, which refers to a mobile device;
- a toll gate, which refers to a *Toll Plaza*;
- a capture device, that can refer to monitoring points of the *Fixed* (pole), *Static* (tripod) or *Mobile* (vehicle) type.

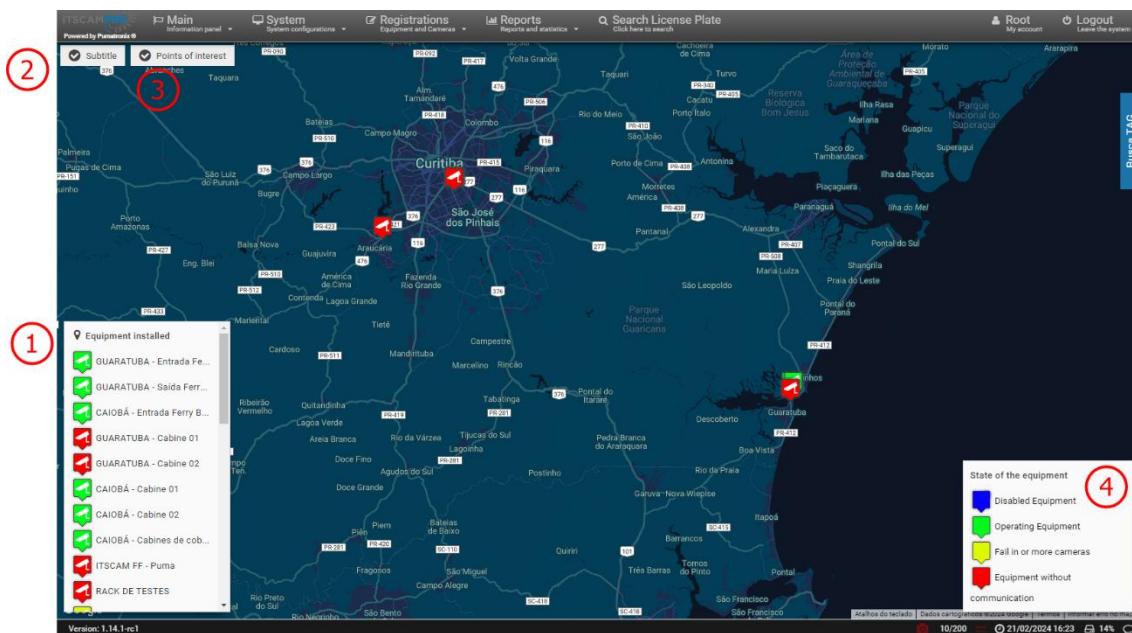


Figure 7 - Map display example: 1) Display of equipment installed, 2) Subtitle enable button, 3) Points of interest enable button, 4) State of the equipment legend

1.7. ITSCAMPRO Mobile App

ITSCAMPRO has an app distributed free of charge in the Google® Play store, which allows you to transform any mobile device (mobile or tablet) with Android® operating system into a plate reading and vehicle information sending equipment for the ITSCAMPRO software.

This application has an Android® version of Pumatronix's *Jidosha* plate reading algorithm, which allows all image processing and plate reading to be performed directly through the mobile device and only the necessary vehicle data is sent to the ITSCAMPRO solution.



Figure 8 – Viewing the image on the Mobile Device

When registering plates with restriction or for monitoring, the alert is automatically sent to the user of the mobile device, who issues a visual signal with the description of the restriction, in addition to the audible signaling of a detected monitored plate, while the alert is issued in the ITSCAMPRO software interface.

In addition to the live view of the images detected by the image capture device of the mobile device, it is possible to access the list of the last registers made by the device:



Figure 9 - Example of the list of the last registers made via mobile device

When searching for registers made using the device interface itself, the date range and sending of data to the ITCAMPRO software are search parameters:

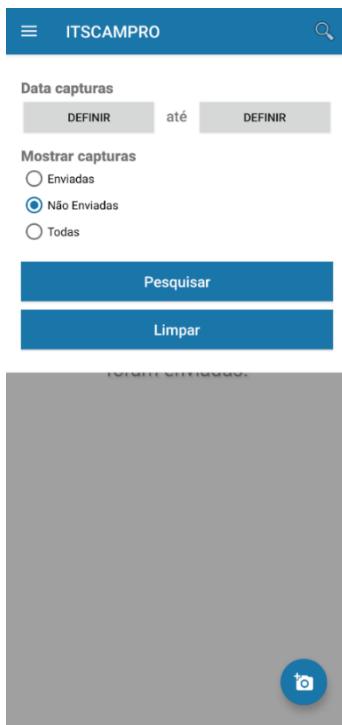


Figure 10 - Filter selection screen when searching for registers

The app activation releases the license plate reading functionality on the device. To activate, contact Pumatronix Sales.

2. Generated Information

In addition to the information accessed through the *Main* menu regarding vehicles, traffic and the system, the data registered by the ITSCAMPRO System can be retrieved in report and graphic format, accessing the options in the *Reports* menu.

The data that can be retrieved refers to vehicle monitoring, captures registered by the system, traffic analysis and system control data. When viewing the data in a report, as with all reports in list format, you can change the sorting by clicking on the title of the column of interest.

2.1. Notifications

In *Registration > Notifications* are presented the messages generated to communicate the occurrence of *Warning*, *Error*, or *Information* type events, such as the registration of a new monitoring, an approved monitoring or a new registered approach. A notification can be generated for a *Group* of users or for specific users.



Date	Hour	Type	Title	Notification	Actions
17/08/2017	10:08:21	Advertência	Mulip	None	X
17/08/2017	10:44:01	Informação	Mulip	Comendo da notificação. Por favor, leia com atenção a mensagem até o fim. Algo de importante está para acontecer no sistema.	X
17/08/2017	10:44:07	Error	Erro	Comendo da notificação 2. Por favor, leia com atenção a mensagem até o fim. Algo de importante está para acontecer no sistema.	X

Figure 11- Example of the list of created notifications

The most recent notifications for the logged-in user can be accessed by clicking on the status bar in the *Notification Center* icon, with access to the history:

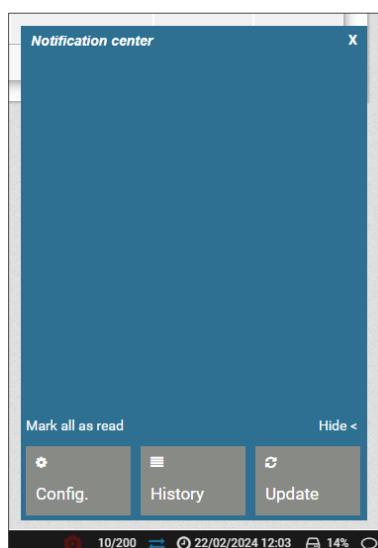


Figure 12 - Example of the logged-in user's Notification Center

2.2. Vehicle Monitoring Report

The ITSCAMPRO system makes vehicle identification registers, through the Automatic Reading of its plates and allows specific vehicle plates to be registered for the purpose of monitoring by the system, which detects the recognition of the specified plate in any of the capture equipment. It is possible to register a license plate separately or a file in CSV format with a list of license plates can be imported. Likewise, the PRF-SPIA system database can be used.

When there is the identification of a vehicle license plate registered for monitoring, the system send out visual alerts and optionally, it can emit sound alerts and send an e-mail with data identified in the capture.

The *Monitoring Report* lists the vehicle identification events monitored based on the filters applied in the search, with the options to filter by the *Equipment* that identified the vehicle, by the time interval, by a specific *Vehicle Plate*, by the source *Database* of the monitored plate, by a specific *User* who created the monitoring, by a *User Group* and by a specific *Description* or based on a fraction of a description. The generated report contains the vehicle registers monitored considering the filters applied and can be exported in *pdf* format.

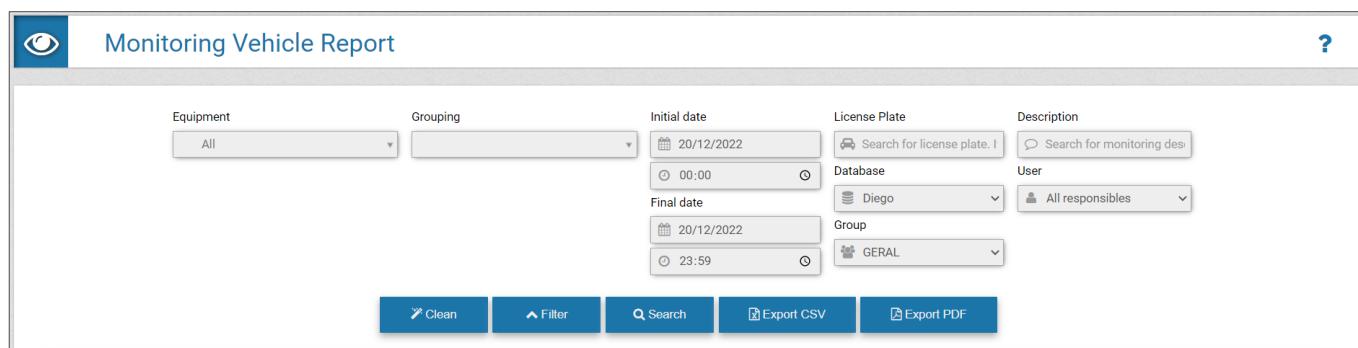
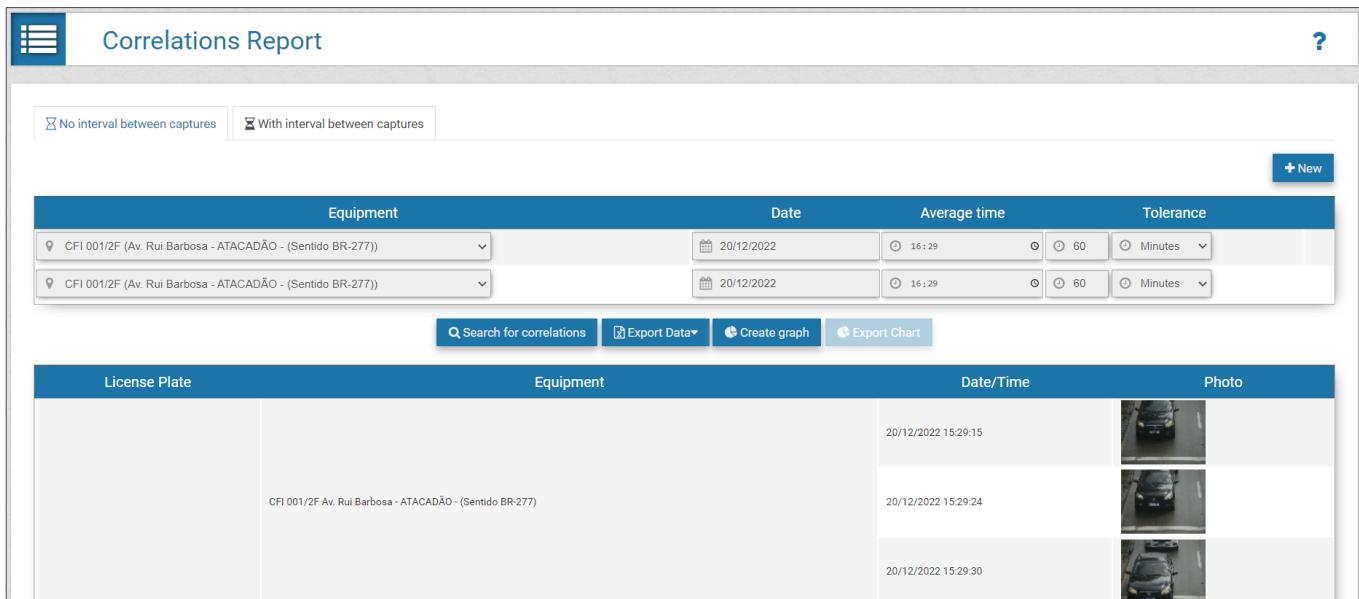


Figure 13 - Home screen when accessing Reports > Vehicle Monitoring

2.3. Correlations Report

The Correlation Report is useful for identifying vehicle behavior patterns, as it shows all the captures made within the selected parameters of the monitoring location (*Equipment*) and the approximate time on a specific date. The data collected makes it easier to identify the frequency with which vehicles are identified at the same monitoring point and to correlate the captures of two or more devices at a given time, indicating a possible route.

In the option to search for correlations *Without interval between captures*, you must specify the monitoring location in *Equipment*, the date and a time interval, which takes into account the time entered in *Average time* and a time *Tolerance*, plus or minus:



The screenshot shows the 'Correlations Report' interface. At the top, there are two filter options: 'No interval between captures' (unchecked) and 'With interval between captures' (checked). Below the filters are four input fields: 'Equipment' (selected 'CFI 001/2F (Av. Rui Barbosa - ATACADÃO - (Sentido BR-277))'), 'Date' (selected '20/12/2022'), 'Average time' (selected '16:29'), and 'Tolerance' (selected '60 Minutes'). A 'New' button is located in the top right corner. Below these are search and export buttons: 'Search for correlations', 'Export Data', 'Create graph', and 'Export Chart'. The main table lists detected vehicles with columns: License Plate, Equipment, Date/Time, and Photo. The table shows three entries for the same vehicle, each with a different timestamp: 20/12/2022 15:29:15, 20/12/2022 15:29:24, and 20/12/2022 15:29:30. Each entry also includes a thumbnail photo of the vehicle.

Figure 14- Example of Correlations Report without interval between captures

Once the correlations between the registers have been found, it is possible to *Create Graph* of the results found and the data on the total number of vehicles by equipment, within the specified period, is presented in graph form:

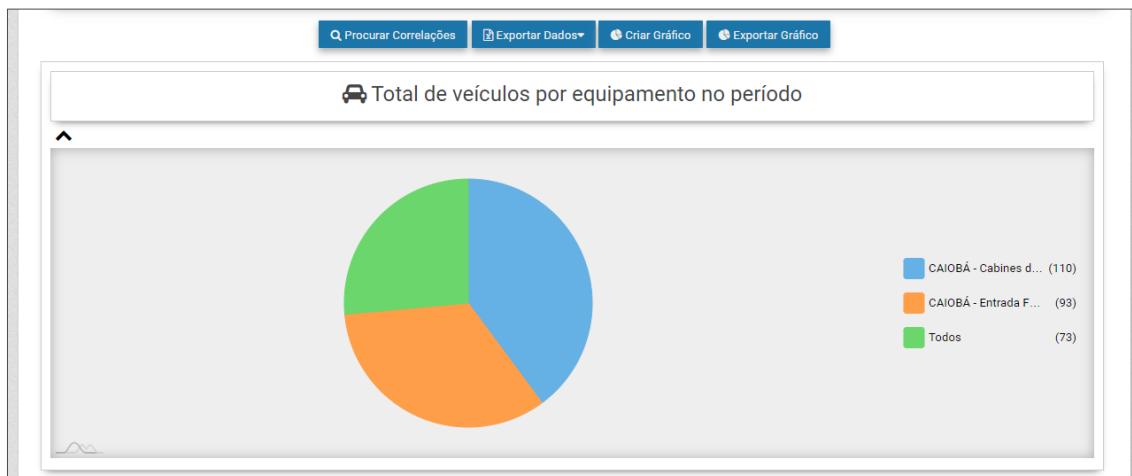
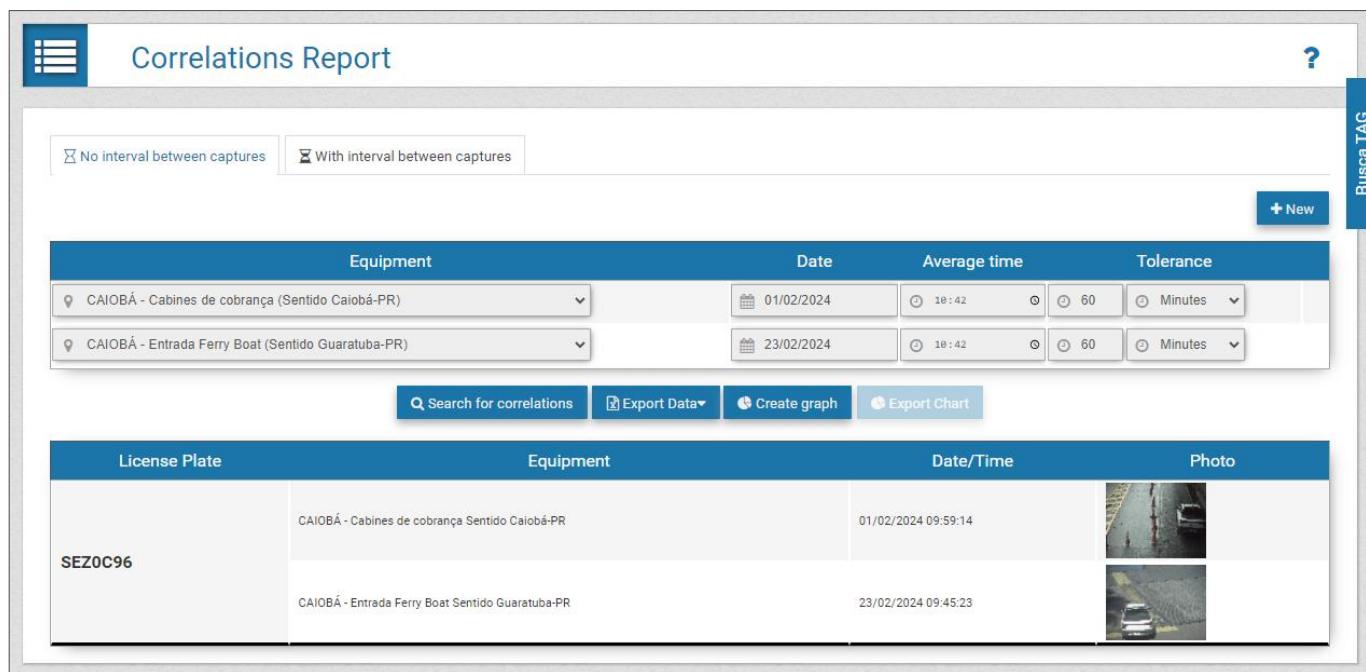


Figure 15 –Example of a graph generated from the results of the Correlations Report

In the filter option *With interval between captures*, you can locate all the vehicles that have been detected within a certain period of time and on a specific route. The initial and final *Equipment* of the route, the initial and final date and time and the *Maximum interval between captures* made on the *Equipment* must be selected:



The screenshot shows the 'Correlations Report' interface. At the top, there are two checkboxes: 'No interval between captures' (unchecked) and 'With interval between captures' (checked). A 'New' button is located in the top right corner. The main table has columns for 'Equipment', 'Date', 'Average time', and 'Tolerance'. Two entries are listed:

Equipment	Date	Average time	Tolerance
CAIOBÁ - Cabines de cobrança (Sentido Caiobá-PR)	01/02/2024	10:42	60 Minutes
CAIOBÁ - Entrada Ferry Boat (Sentido Guaratuba-PR)	23/02/2024	10:42	60 Minutes

Below this are buttons for 'Search for correlations', 'Export Data', 'Create graph', and 'Export Chart'. A secondary table below shows 'License Plate', 'Equipment', 'Date/Time', and 'Photo'. It lists two entries for license plate 'SEZ0C96':

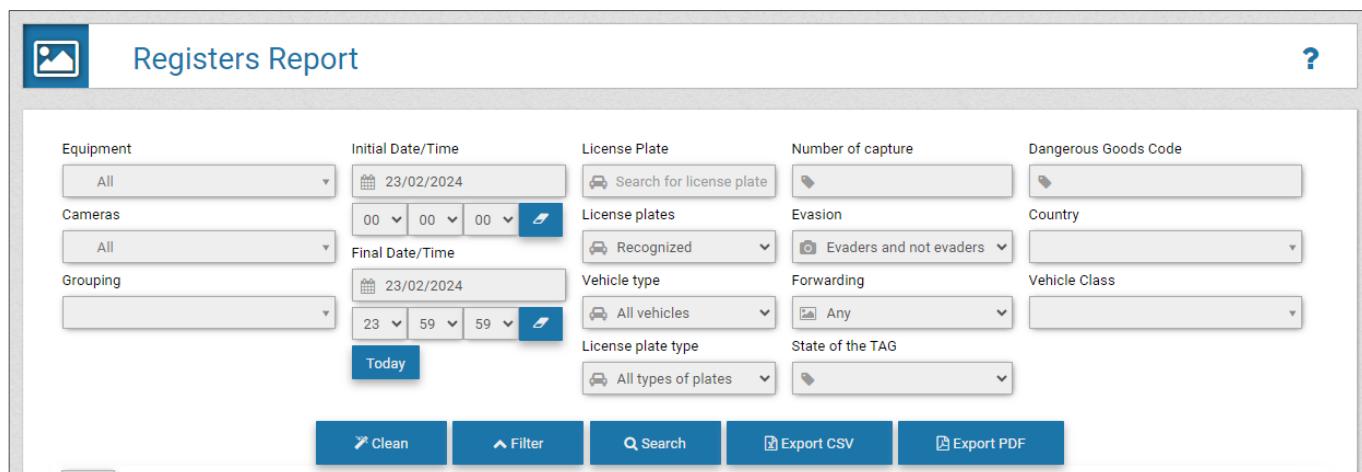
License Plate	Equipment	Date/Time	Photo
SEZ0C96	CAIOBÁ - Cabines de cobrança Sentido Caiobá-PR	01/02/2024 09:59:14	
	CAIOBÁ - Entrada Ferry Boat Sentido Guaratuba-PR	23/02/2024 09:45:23	

Figure 16 - Correlations Report example considering the maximum interval between captures

2.4. Registers Report

All vehicle registers stored in ITSCAMPRO can be retrieved in report format. The search criteria for registers in the database can be specified by clicking on *Filter*, which displays the fields available for generating a report:

- by *Equipment* (may correspond to one or more equipment);
- by the devices that made the image capture (*Cameras*);
- by the *Groupings* registered for the COMPARE function;
- by the time interval in which the register occurred, specifying the initial and final date and time;
- by a specific *License Plate*;
- by the *License Plates* automatically recognized and/or the not recognized;
- by the *Vehicle Type*, that is, it is possible to know if the register is of a motorcycle or some other type of vehicle;
- by the *License Plate Type*, which selects the plate registers based on the background color (light or colored in relation to the text);
- by *Number of Capture* which identifies the register made in ITSCAMPRO;
- by *Evasion*, presenting only the registers of vehicles *Evaders only*, the *Not Evaders* ones or both;
- by the *Forwarding* of registers from one ITSCAMPRO system to another;
- by the *State of the TAG* installed in the vehicle, if the devices are associated with a TAG server which can display the status *Released*, *Blocked*, *Not Found* or *Communication Error*;
- by the *Dangerous Goods Code*, which displays in the reports and on the *Information of register* screen, the dangerous goods code detected in the vehicle image;
- by the *Country* of the plate, which allows to identify if it comes from Brazil/Mercosur, Argentina, Chile, Costa Rica, Mexico, Paraguay or Uruguay;
- by *Vehicle Class*, when the *CLASSIFIER* function is activated for the image capture and processing device, which identifies if the register is of a *Car*, *Motorcycle*, *Truck* or *Bus*.

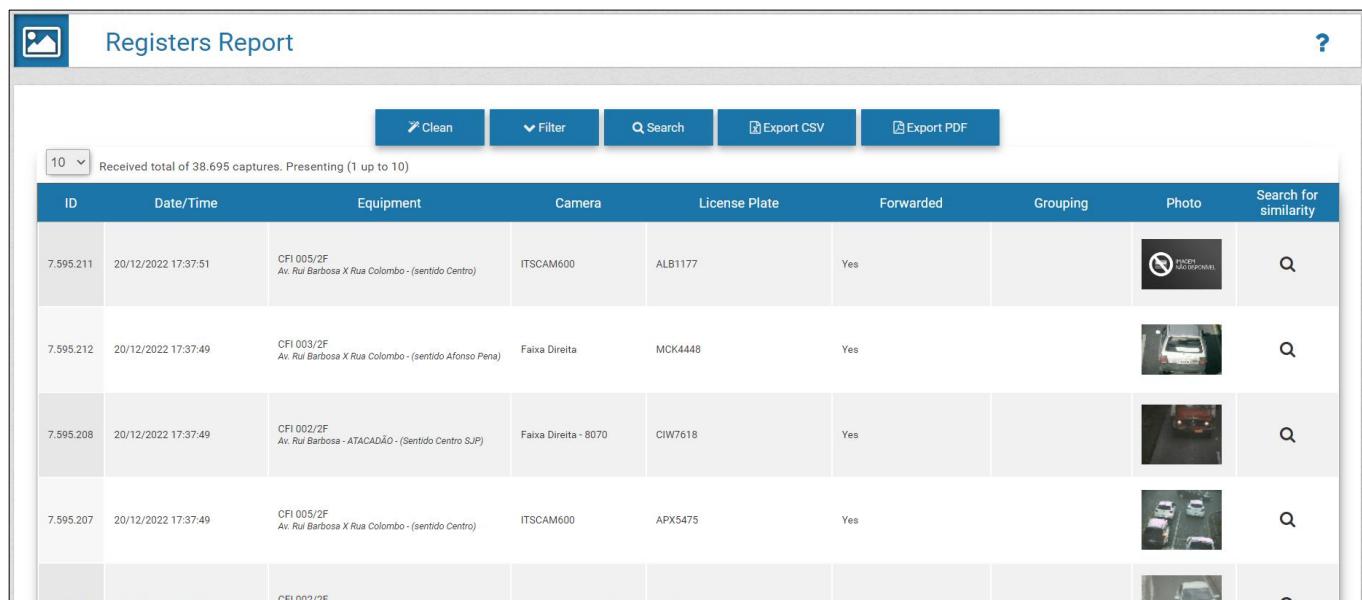


The screenshot shows the 'Registers Report' search interface. It includes filters for Equipment (All, Cameras, Grouping), Initial Date/Time (23/02/2024), License Plate (Search for license plate), Number of capture (0), Dangerous Goods Code (empty), and various status filters like Evasion, Evaders and not evaders, Forwarding, Vehicle type (All vehicles), License plate type (All types of plates), and State of the TAG. Buttons for Clean, Filter, Search, Export CSV, and Export PDF are at the bottom.

Figure 17 - Screen of the filters that can be applied to the search on the Registers Report

Vehicle type and license plate information can be retrieved only if it is associated with the register. This information is sent by equipment developed by Pumatronix such as ITSCAM 450, ITSCAM 600, ITSCAM FF, VTR 600. To confirm the submission to another ITSCAMPRO, a search may be performed considering the forwarding status.

ITSCAMPRO allows to generate the search report in a file with the format *pdf* and the type *CSV* (comma-separated values). However, in the *CSV* file, the images of the registers are not exported.



The screenshot shows the 'Registers Report' search results table. It displays 10 captures out of 38,695. The columns are: ID, Date/Time, Equipment, Camera, License Plate, Forwarded, Grouping, Photo, and Search for similarity. Each row includes a thumbnail of the captured image and a search icon.

ID	Date/Time	Equipment	Camera	License Plate	Forwarded	Grouping	Photo	Search for similarity
7.595.211	20/12/2022 17:37:51	CFI 005/2F Av. Rui Barbosa X Rua Colombo - (sentido Centro)	ITSCAM600	ALB1177	Yes			
7.595.212	20/12/2022 17:37:49	CFI 003/2F Av. Rui Barbosa X Rua Colombo - (sentido Afonso Pena)	Faixa Direita	MCK4448	Yes			
7.595.208	20/12/2022 17:37:49	CFI 002/2F Av. Rui Barbosa - ATACADÃO - (Sentido Centro SJP)	Faixa Direita - 8070	CIW7618	Yes			
7.595.207	20/12/2022 17:37:49	CFI 005/2F Av. Rui Barbosa X Rua Colombo - (sentido Centro)	ITSCAM600	APX5475	Yes			
		CFI 002/2F						

Figure 18 - Example of a filter result applied to the Capture Report

2.5. Search for Similarity

The ITSCAMPRO *Similarity Search* tool presents a report of the images of vehicles registered and stored in ITSCAMPRO and in a database, which have characteristics like an image used as a base. This functionality is released in the *COMPARE* module, which requires the upload and installation of the license in the ITSCAMPRO software, the adaptation or installation of the image capture devices and the activation of the module, connecting a *Hardkey* to the processor, which identifies the number of devices that can be configured. Another requirement for the search to locate registers with similar images is the enabling of the image capture device to extract vehicle data from the captured images.



Similarity Search Application: For image similarity search functionality, hardkey is required to be used, which limits the application to the number of image capture devices configured.

In situations where the additional monitoring point has a different framing from the base image, it is possible to delimit a *Region of Interest* and only the portion delimited in the image will be used as base, which optimizes the search for similar vehicles, optimizing COMPARE's performance:

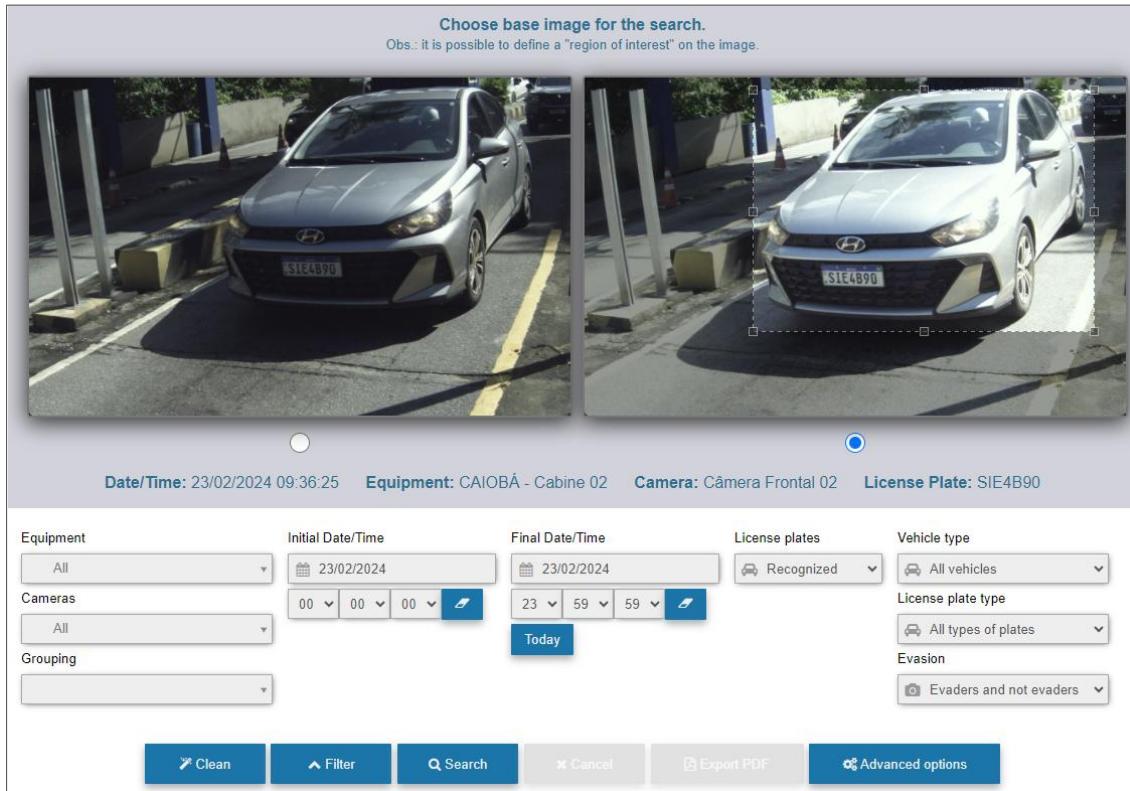


Figure 19 - Screen of the search for similarity with delimitation of the region of interest on the chosen image

The filter options allow you to specify which information of interest should be searched for in registers with image similarity. The system verifies whether there is a *Monitored Road* registered with the equipment and, if so, the fields for the *Similarity Search* filter are optimized and consider the times and equipment configured for the section, when the image used as a base refers to a ITSCAMPRO register. When the base image refers to an external file, the option in the [Reports > Search for Similarity](#) menu must be accessed.

The images presented in the *Capture Report* can be used as a basis for searching for registers with similar images. To do this, simply access the functionality in the *Similarity* column from the *Registers Report*, or by accessing the *Information of register* from the magnifying glass icon. The result of the search is presented in report format, displaying in the *Similar Image* column those that have been located in the ITSCAMPRO database:



Figure 20 - Similarity Search screen for the detected capture

The *Compare Images* option in the icon on the right shows both images in an enlarged format, allowing a better visualization of details from the one that was found as similar and the one used as a base, complemented by the *Magnifying Glass* functionality over images:

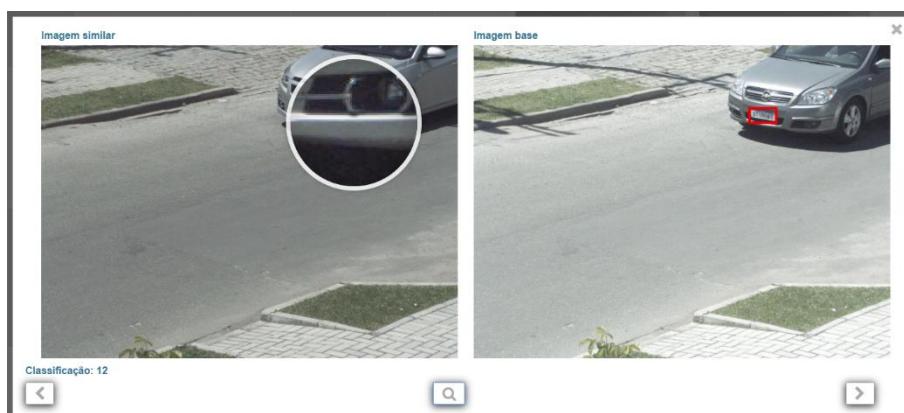


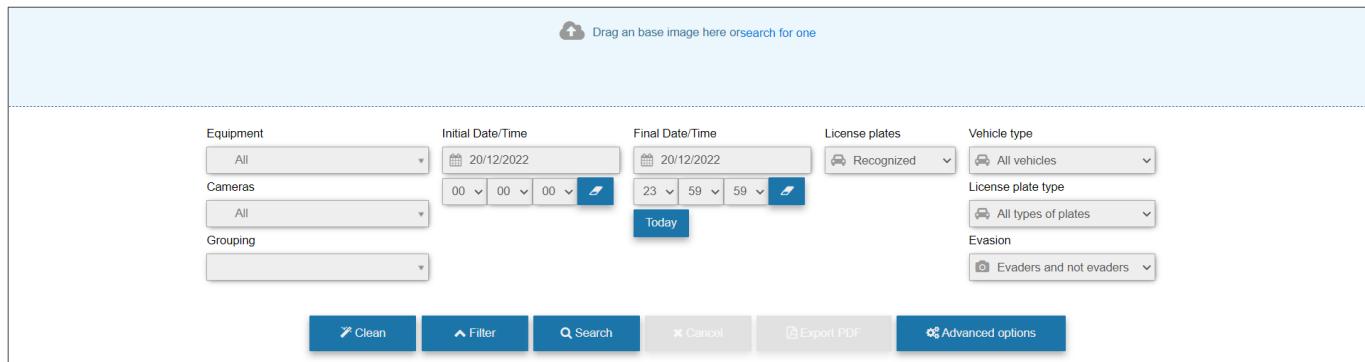
Figure 21 - Screen of Compare Images function from the search for similarity result

2.5.1. Search for Similarity Using External Image

To use an external image as a reference on search for similarity, the menu *Reports > Search for Similarity* must be accessed. In this option, the image file must be sent in *jpg* format, with a minimum resolution of 800x600 (SVGA), saved in a database external to ITSCAMPRO and the search criteria for registers must be filled in manually.



External image resolution: The external image in jpg format must have a minimum resolution of 800x600 (SVGA), so that it can be used by the comparison algorithm with sufficient information in the search for similar vehicles.



The screenshot shows the search interface for similar vehicles. It includes fields for Equipment (All, Cameras, Grouping), Initial Date/Time (20/12/2022, 00:00:00), Final Date/Time (20/12/2022, 23:59:59), License plates (Recognized), Vehicle type (All vehicles), and Evasion (Evaders and not evaders). Buttons at the bottom include Clean, Filter, Search, Cancel, Export PDF, and Advanced options.

Figure 22 - Similarity Search start screen using external image

2.5.2. Groupings

The registers stored in the database can be more easily located when added to the *Groupings*, which consists of a common identifier that can be added to the description of the register, which makes it easier to search the database. You can characterize a register in a grouping when you access *Information of register* and the add option, which opens the field for creating a grouping description:

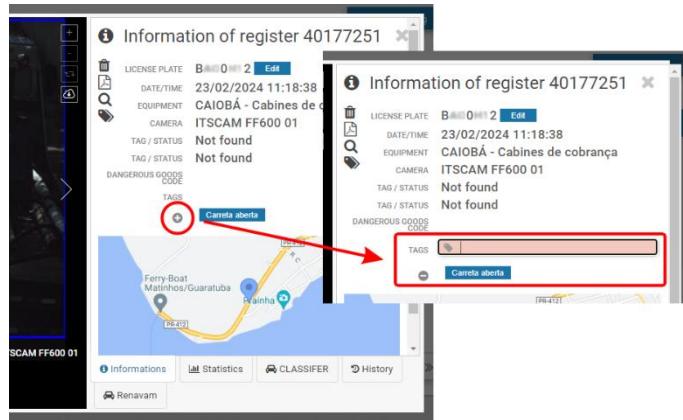


Figure 23 - Field of application of Groupings to the register made

Images associated with a grouping are not removed by the automatic disk space management process.

Accessing from the *Registrations* menu, *Groupings* are displayed in list form, with the images captures from associated registers displayed in miniature:

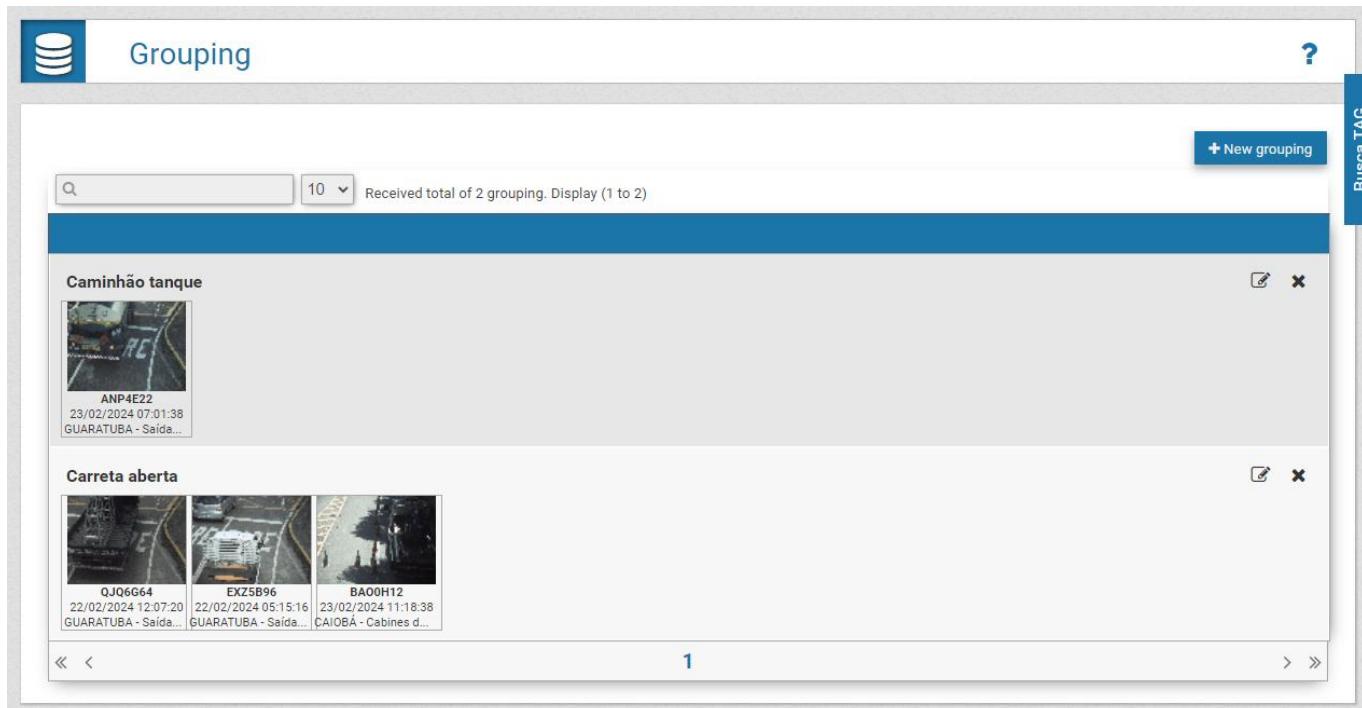


Figure 24 - Example screen of Groupings applied to registers

2.6. Search License Plate Report

Searching for a specific plate or part of a plate stored in the database can be quickly performed in the *Search Plate* option, always visible in the top menu:



Figure 25 - Example of using the Search Plate field

The search screen for similar plates opens in a new browser tab and initially displays only a list of similar plates found in the registers. The link referring for one of the plates located shows the respective registers listed on the right, indicating the *Date*, the *Equipment* and the device responsible for the register. Detailed information on the register can be viewed by clicking on the captured image.

Similar License plates Total of 1 license plate(s) found		Information of the license plate - A 000001			
		Date	Equipment	Camera	Photo
1	1	13/11/2019 17:52:40	SJP - TESTE III - (405LM04)	Faixa Esquerda - 4079	
	<	11/11/2019 18:58:52	SJP - TESTE III - (405LM04)	Faixa Esquerda - 4079	
	>	11/11/2019 14:13:53	SJP - TESTE III - (405LM04)	Faixa Esquerda - 4079	
		07/11/2019 14:40:49	SJP - TESTE III - (405LM04)	Faixa Esquerda - 4079	
		30/10/2019 10:02:44	SJP - TESTE III - (405LM04)	Faixa Direita - 4076	
		29/10/2019 14:23:58	SJP - TESTE III - (405LM04)	Faixa Esquerda - 4079	

Figure 26 - Page with the result of the Search Plate function

2.7. Traffic Volume Report

The ITSCAMPRO system was developed as a statistical traffic system and the *Traffic Volume Report* is the tool that compiles the data of registers in a graph, which displays the number of vehicles detected in a given location. The usual traffic volume is displayed for the selected week, displaying a graph for each day of the week with the number of registers indicated per hour.

The report is generated considering the selected equipment and the respective devices, an initial and final date, as the period considered will always correspond to one week (7 days). The report can be exported in *pdf* or *csv* format.

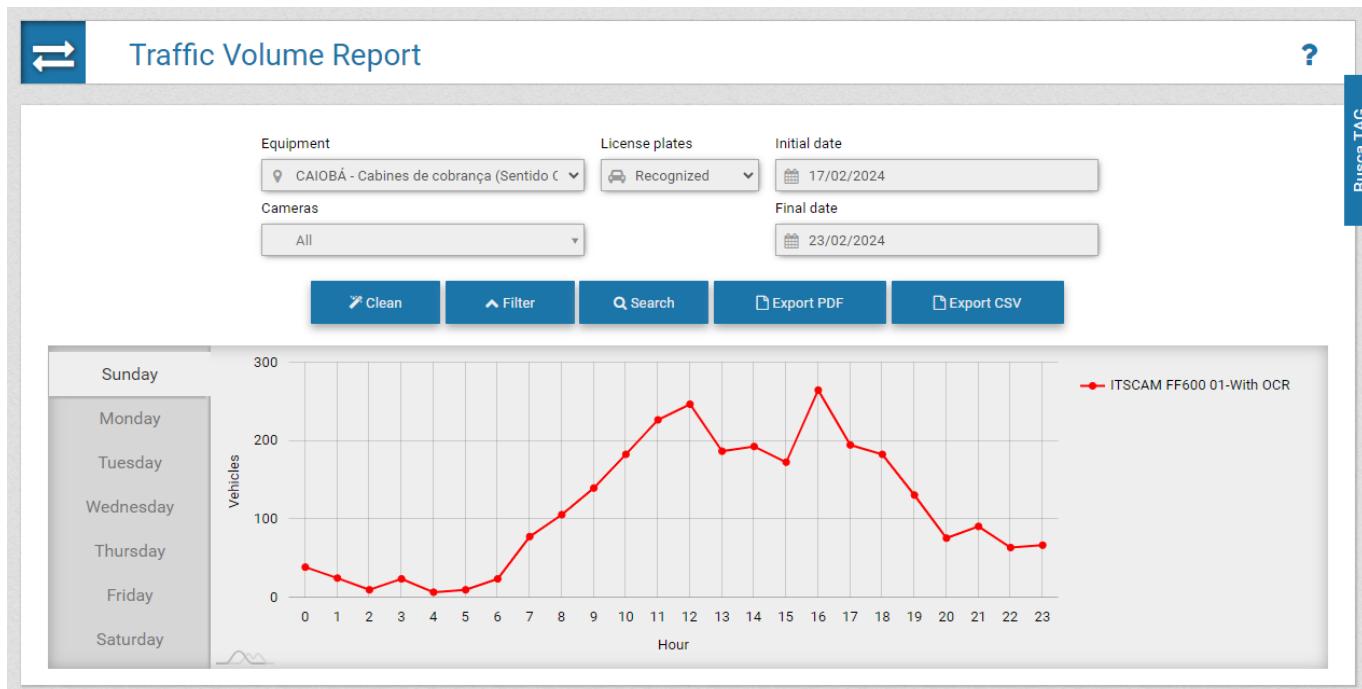


Figure 27 - Example of Traffic Volume Report generated for equipment with 4 capture devices

2.8. Speed & Time Report

ITSCAMPRO has the concept of *Section*, that is, two image capture equipment are defined and the route between these points can be used to calculate differentiated statistics such as the flow of vehicles, the average time spent to travel the *Monitored Section* and the average speed of the road.

In this report, the parameter of *Cutting Time*, allows to enter the time period equivalent to the maximum that a route may take, which causes to be removed from the calculation the vehicles that, for example, stopped during the route. The other parameters for issuing this report are the section and the initial and final dates of the search.

The generated reports can be exported in a *pdf* or *CSV* file.

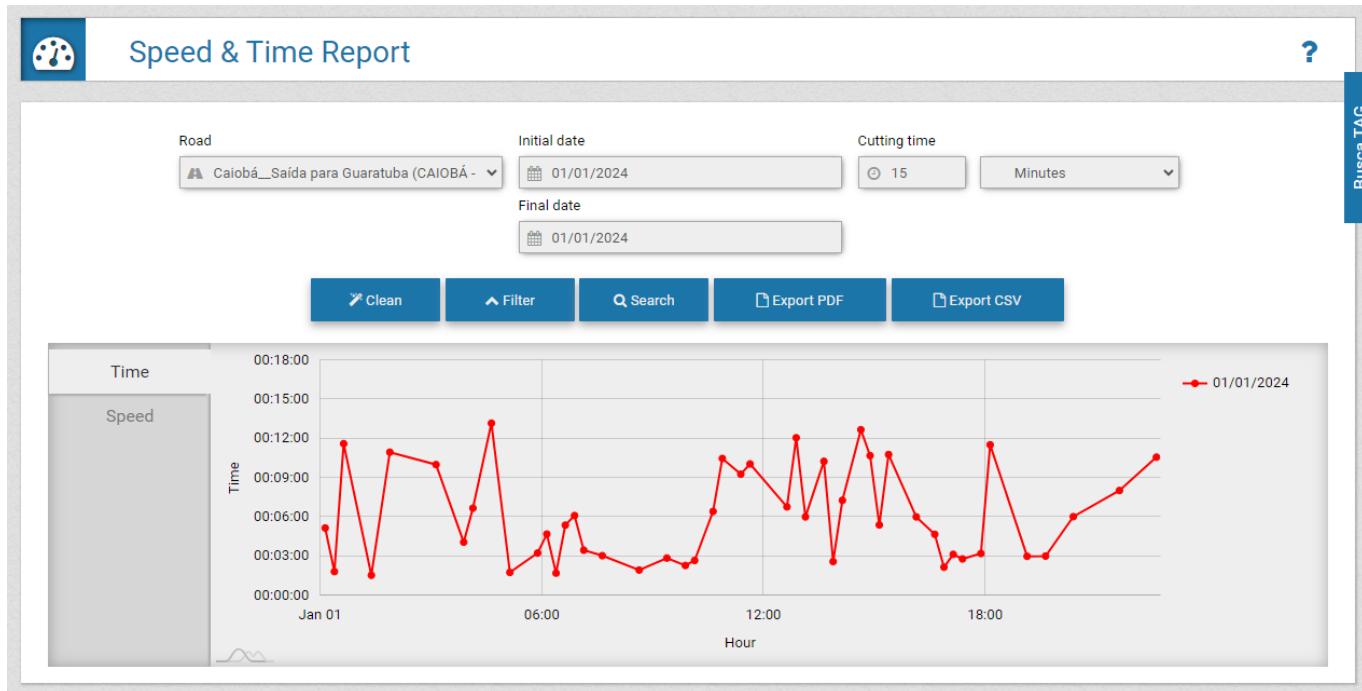


Figure 28 - Example of a Time graph generated when searching for registers in monitored section

2.9. Origins and Destination Report

The *Origins and Destination Report* displays in graphical form the registers made by destination device, starting from a location (*Equipment*) of origin. By selecting a device as the origin, ITSCAMPRO searches for registers among the registered devices and locates those with the same license plate identified in the specified time interval (start and end date and time).

The graph generated shows the number of vehicles that were identified at the point of origin and were later detected on another device in the system, indicating the percentage of total registers per device. This makes it possible to statistically verify the vehicles' probable routes.

The quantitative data and the percentage per destination device are displayed by hovering the pointer over a fraction of the graph. The report can be exported as a *pdf* or *CSV* file.

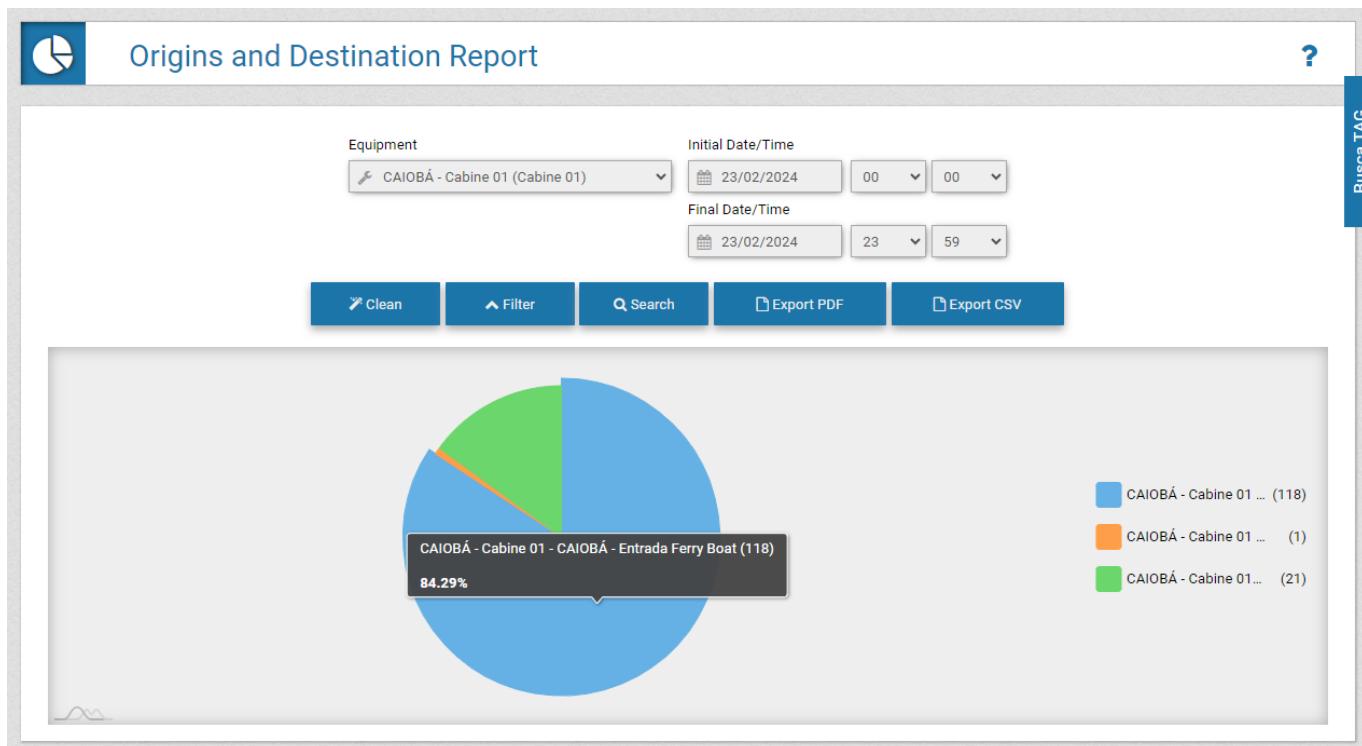
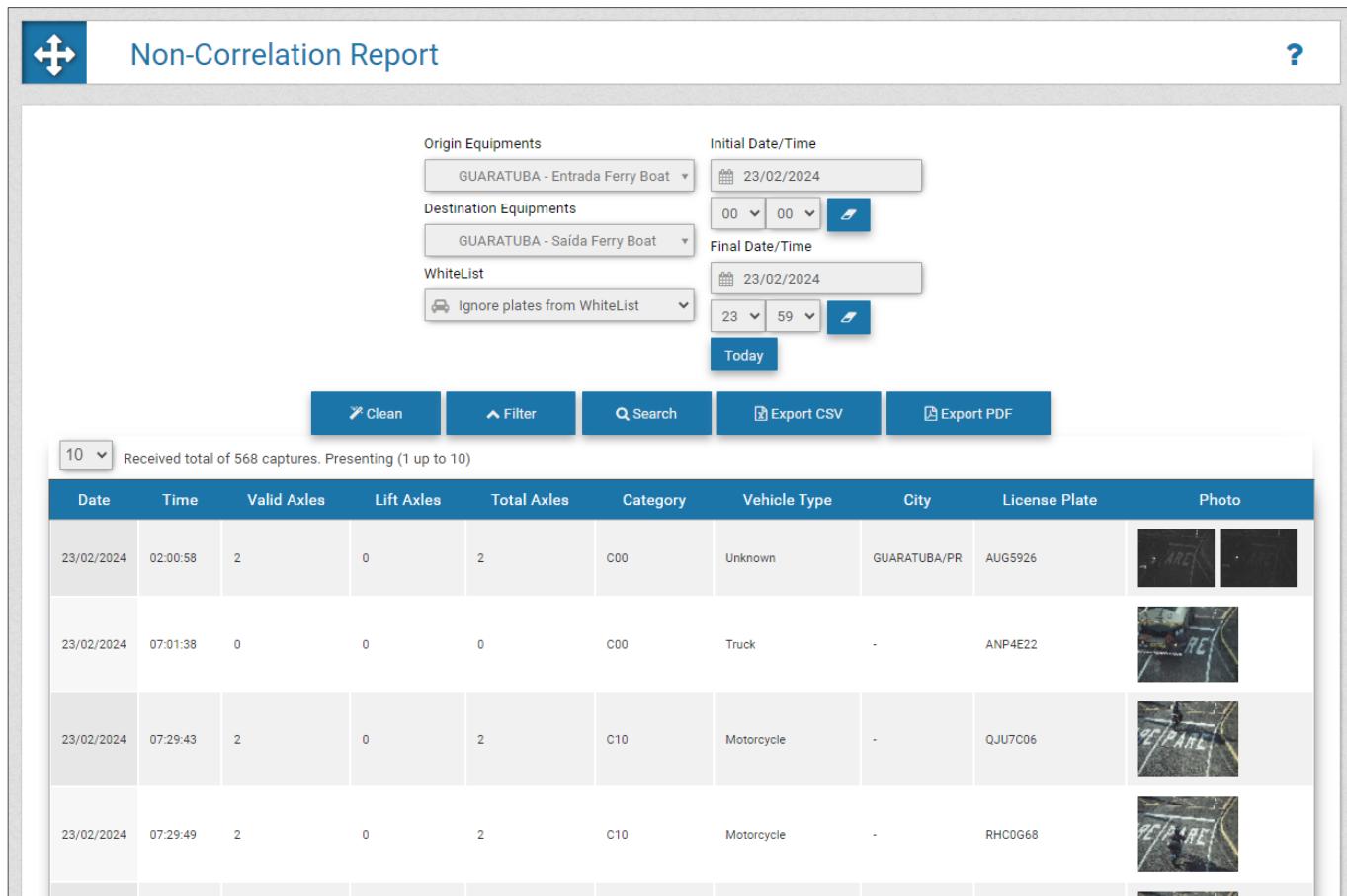


Figure 29 – Example of Origin and Destination graph

2.10. Non-Correlation Report

The *Non-Correlation Report* is useful for identifying vehicle behavior patterns, considering a route at the selected destination and origin locations (*Equipment*), as it extracts data from vehicles that have been detected at the destination equipment without having been identified at the origin equipment. For example, if you have a route defined for a type of vehicle, such as trucks, all those that have passed through the *Destination Equipment* must have passed through the *Origin Equipment* in order to comply with the route. The result of the report will show all the vehicles that did not follow the specified route within the specified period.

Using the *Whitelist* feature, it is possible to include vehicle license plates that should be disregarded in the *Non-Correlation Report*, removing from the result those that were not identified in the equipment of origin when they were registered in *Registrations > Whitelist*.



Non-Correlation Report

Origin Equipments: GUARATUBA - Entrada Ferry Boat
 Destination Equipments: GUARATUBA - Saída Ferry Boat
 WhiteList: Ignore plates from WhiteList

Initial Date/Time: 23/02/2024 00:00
 Final Date/Time: 23/02/2024 23:59

Today

Clean **Filter** **Search** **Export CSV** **Export PDF**

10 Received total of 568 captures. Presenting (1 up to 10)

Date	Time	Valid Axles	Lift Axles	Total Axles	Category	Vehicle Type	City	License Plate	Photo
23/02/2024	02:00:58	2	0	2	C00	Unknown	GUARATUBA/PR	AUG5926	
23/02/2024	07:01:38	0	0	0	C00	Truck	-	ANP4E22	
23/02/2024	07:29:43	2	0	2	C10	Motorcycle	-	QJU7C06	
23/02/2024	07:29:49	2	0	2	C10	Motorcycle	-	RHC0G68	

Figure 30 - Example of Non-Correlation Report generated

2.11. Altered License Plates Report

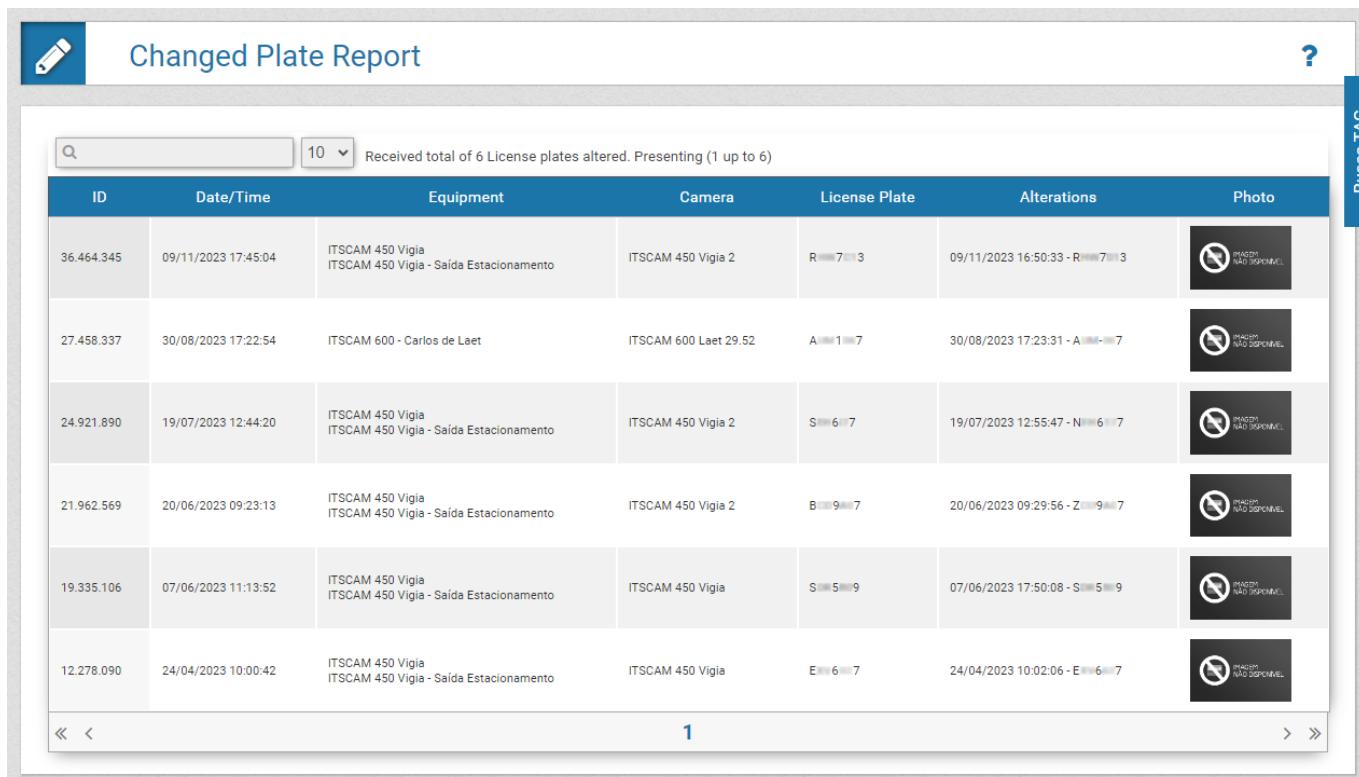
Automatic Reading of Vehicle Plates may display incorrectly read characters. This misreading can be caused by external factors, such as occlusion of part of the plate, poor state of conservation or by some problem in the image. Then, ITSCAMPRO allows authorized users to change the card identified by the system and associated with the register.

The plate change data is stored in the register history, which indicates the user who performed the change and the initial reading value performed. Other users with access permission can view this change history in list or report form.

When viewing the data of records with a changed license plate, is possible to change the report's sorting by clicking on the column heading: *ID*, *Date/Time*, *Equipment*, *Camera*, *License Plate* or *Alterations*.



Plate reading: When ITSCAMPRO receives a license plate recognized as "0000000", "" or when no data is reported, it is correctly set to empty.



ID	Date/Time	Equipment	Camera	License Plate	Alterations	Photo
36.464.345	09/11/2023 17:45:04	ITSCAM 450 Vigia ITSCAM 450 Vigia - Saída Estacionamento	ITSCAM 450 Vigia 2	R 7 3	09/11/2023 16:50:33 - R 7 3	
27.458.337	30/08/2023 17:22:54	ITSCAM 600 - Carlos de Laet	ITSCAM 600 Laet 29.52	A 1 7	30/08/2023 17:23:31 - A 1 7	
24.921.890	19/07/2023 12:44:20	ITSCAM 450 Vigia ITSCAM 450 Vigia - Saída Estacionamento	ITSCAM 450 Vigia 2	S 6 7	19/07/2023 12:55:47 - N 6 7	
21.962.569	20/06/2023 09:23:13	ITSCAM 450 Vigia ITSCAM 450 Vigia - Saída Estacionamento	ITSCAM 450 Vigia 2	B 9 7	20/06/2023 09:29:56 - Z 9 7	
19.335.106	07/06/2023 11:13:52	ITSCAM 450 Vigia ITSCAM 450 Vigia - Saída Estacionamento	ITSCAM 450 Vigia	S 5 9	07/06/2023 17:50:08 - S 5 9	
12.278.090	24/04/2023 10:00:42	ITSCAM 450 Vigia ITSCAM 450 Vigia - Saída Estacionamento	ITSCAM 450 Vigia	E 6 7	24/04/2023 10:02:06 - E 6 7	

Figure 31 – Example of Altered License Plates Report

3. Additional Documentation

Product	Link	Description
ITSCAMPRO	Integration Manual	Programming and integration manual containing the information needed to integrate ITSCAMPRO with an application.

4. Software Specifications

ITSCAMPRO System version 1.14.1 can be installed on any Server running Ubuntu Server 20.04 or 22.04. Migration to 1.8.6 and higher may take a while if there are too many registers in the upload queue. For versions earlier than 1.1.0, the system update must be assisted because the server cannot update automatically.

In case of updating a version prior to 1.5.7, it is necessary that a new license file is generated and updated on the server, as there was a change in the file format. If an incorrect license file is used, the system will block some features, such as Reports and Specific Communication Protocols. Please contact Pumatronix Technical Support for any questions and for the generation of a new license file. To install the update, follow the steps in the [ITSCAMPRO Update](#).

To access the software interface, a device with one of the following browsers must be used:

- Google Chrome version 56 or higher;
- Microsoft Edge version 121 or higher;
- Mozilla Firefox version 140 or higher;

- Microsoft Internet Explorer version 11.

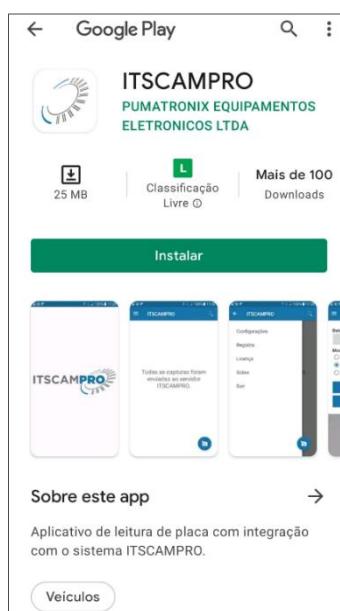
All the features and processes for integrating the ITSCAMPRO System with an API, or with external servers, are specified in the Integration Manual and should be consulted for more details on setting the system.

4.1. Android Device Specifications for the ITSCAMPRO App

The ITSCAMPRO app can run on any mobile device (mobile or tablet) with Android® operating system version 8.0 or higher.

For a good performance of the *Jidoshā* card reading algorithm in real time, a cell phone with at least 4 colors and 4G of RAM is recommended.

The download of the ITSCAMPRO application is available in the Google® Play store of the mobile device and must be registered as a new equipment in the ITSCAMPRO software.



5. Licensing

ITSCAMPRO is software that requires a license to function. This license specifies the size of the installation and features enabled. The items that can be licensed are:

- Number of Cameras:* Maximum number of devices that can connect to the ITSCAMPRO server;
- Traffic Module:* Availability of traffic volume reports such as [Time and Speed](#), [Origin and Destination](#), among others;
- Monitoring Module:* Registration of monitored vehicles, related reports and alerts when detecting a monitored vehicle;
- Telemetry Module:* Equipment monitoring, such as NUCs, image capture devices, etc.;
- Multiple Language Support:* Language application in the system interface. Currently, it can be chosen between Portuguese, English or Spanish;
- ITSCAMPRO Application Support:* Registration of mobile devices with the ITSCAMPRO application. Additionally, it allows the registers sent by the devices to be saved in the system;
- Detecta-SP support:* Integration with the Detecta-SP system;

- *TAG support:* Integration with the TAG server for installation in conjunction with NEVADA. The NEVADA system is used to monitor toll evasion;
- *Support Search for Similarity of Image:* Performs the search for images with similar content from enabled image capture devices;
- *Number of Fit Cameras to Calculate Descriptors:* Maximum number of devices that may be configured to perform the calculation of the image descriptor on the Server;
- *Support for Integration with PM-PR;*
- *Integration Support with Denatran;*
- *Support for Integration with SPIA-PRF;*
- *Support for Integration with SEFAZ-AL;*
- *Support for Integration with PM-MG (Helios);*
- *Integration with the ONE System:* This functionality enables integration with the state integrator system;
- *Antares Support:* Integration with the Antares system;
- *Support for OCR on the Server:* Enables the ITSCAMPRO Server to run OCR on the no plate registers made by the enabled image capture devices;
- *Number of Cameras with OCR:* Maximum number of devices that may be configured to run the OCR on the server;
- *Cargo ID Functionality:* Allows ITSCAMPRO to read dangerous cargo and present this information in the reports;
- *Integration with third-party cameras:* This functionality allows cameras from other manufacturers to send images to ITSCAMPRO through the FTP protocol;
- *Support for Searches by vehicle classification:* Allows ITSCAMPRO to receive Class information from devices with ITSCAM 600 and provide searches on the basis of the class of the vehicle detected in the image;
- *Support for the CLASSIFIER algorithm on the Server:* Allows the classification detection functionality to be performed on the server and that even older equipment can be used in searches by class.

The ITSCAMPRO license is a single file associated with the hardware on which the system was installed. If it is necessary to install on another machine, a new license must be requested from Pumatronix Technical Support. This change in the amount of equipment that can connect simultaneously to ITSCAMPRO can be requested from Pumatronix Technical or Commercial Support.

For the operation of the ITSCAMPRO application on mobile devices (mobile or tablet), with OCR reading (*Jidosha*) and integration with the ITSCAMPRO solution, specific licenses are required, according to the amount of equipment released for the installation.



Similarity Search Application: For image similarity search functionality, hardkey is required to be used, which limits the application to the number of image capture devices configured.



Software License: Software and related documentation are protected by copyright. By installing the software, you agree to the terms of the License Agreement.

6. Initial Configuration

At the beginning of using ITSCAMPRO system the access must be configured, as the default configuration of ITSCAMPRO allows the use of system by connecting devices to the same data network. However, access

to the system and information can be made by other means, configured through the *System Configuration* menu:

- via the Internet, configuring the fields of the *External Access* tab;
- by the Android app, configurable through the fields of the *Mobile App* tab.

The other necessary configurations can be found in the ITSCAMPRO Integration Manual.

7. First Access

ITSCAMPRO can be accessed by the Google Chrome browser on devices that are on the same data network, by the address for external access and by devices that have the Android/iOS application installed. The IP address of the product is provided by Pumatronix, along with the default user information and password.

To access the system, the IP address provided must be entered in the address bar. Then, you must enter the user credentials. If the main user of the system is not provided, use *root* user and *root* password. However, in the first access, it is indicated to create the other users and restrict the use of the ITSCAMPRO *administrator* account.



Figure 32 - ITSCAMPRO System login screen

The first time it is logged into ITSCAMPRO, the home screen must be configured by accessing the *User* settings.



Distribution of information: The content generated by ITSCAMPRO (captured images and information) is protected by user and password. However, it is up to the system administrator to control users who have access to information and the dissemination of content.

8. Care and Maintenance

Some care is required to ensure the performance of the product and extend its service life.



The use of the product presents risks, which are presented in the [Handling Risks](#) section.

8.1. Access Control and Information Availability

Users' access to ITSCAMPRO information may be limited by an Access *Profiles* setting, which allows to associate which system screens the user profile will be able to interact with:

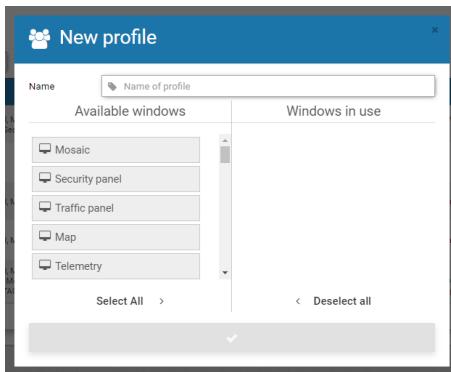


Figure 33 - Configuration screen for a new access Profile

As the same profile is assigned to more than one user, additionally is possible to create *Groups* which allow multiple users of the system to access and view images only from the equipment authorized for the group and share the list of monitored vehicles.

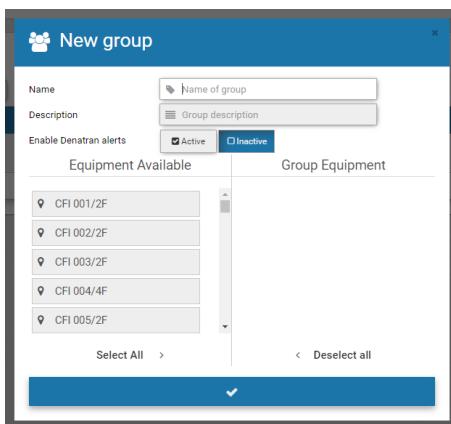
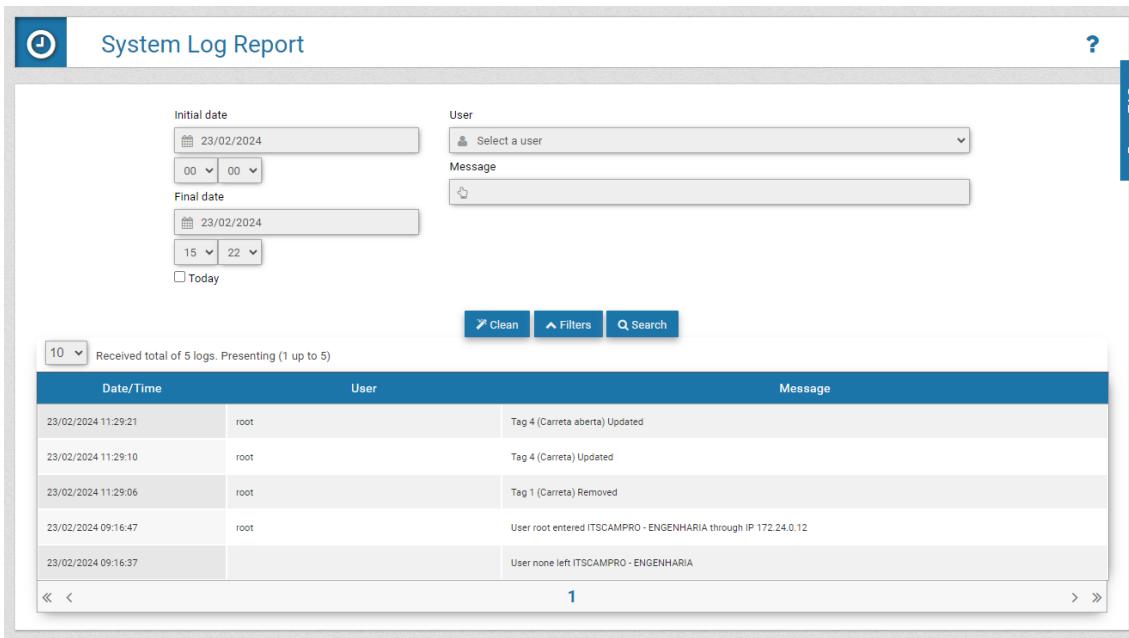


Figure 34 - Setting up a new Group

8.1.1. ITSCAMPRO Usage Log

ITSCAMPRO receives data from multiple devices simultaneously and can be manipulated by users with different access patterns. For this reason, the *System Log Report* allows users' actions to be audited. The interface allows to change the ordering of the list of logs and to search in all columns of the table.



The screenshot shows the 'System Log Report' interface. At the top, there are filters for 'Initial date' (23/02/2024, 00:00) and 'Final date' (23/02/2024, 15:22), a 'User' dropdown ('Select a user'), and a 'Message' search input. Below the filters, a message states 'Received total of 5 logs. Presenting (1 up to 5)'. The main area is a table with three columns: 'Date/Time', 'User', and 'Message'. The data is as follows:

Date/Time	User	Message
23/02/2024 11:29:21	root	Tag 4 (Carreta aberta) Updated
23/02/2024 11:29:10	root	Tag 4 (Carreta) Updated
23/02/2024 11:29:06	root	Tag 1 (Carreta) Removed
23/02/2024 09:16:47	root	User root entered ITSCAMPRO - ENGENHARIA through IP 172.24.0.12
23/02/2024 09:16:37		User none left ITSCAMPRO - ENGENHARIA

At the bottom, there are navigation buttons for '1' and '10'.

Figure 35 - Example of System Log Report per user

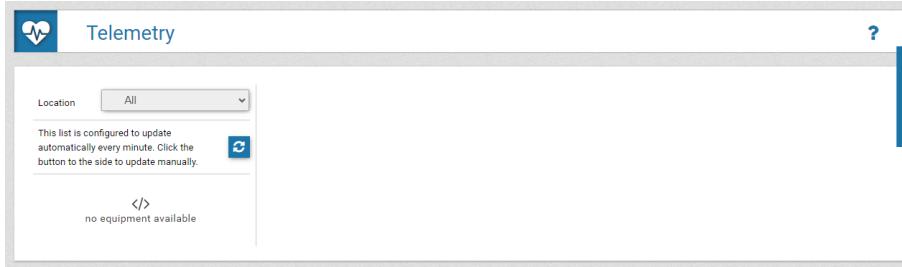
8.2. Equipment Status

ITSCAMPRO can be used for equipment management and screening traffic infraction notices. On the *Telemetry* screen, the equipment can be centrally administered and maintained.

Each registered equipment is displayed with a colored icon that indicates whether the equipment has the service running and the latency time of the network within the expected limit; it has the latency time of the network too high or if the equipment has the service stopped/is not responding on the network.

Image capture devices are also displayed with colored icons indicating that the latency time of the network is within the expected limit, too high, or the equipment is not responding on the network.

When selecting an equipment from the list, it is possible to view detailed information about the equipment, including images (if the user is allowed to manipulate the equipment) and the possibility of updating its status (modifying the service in operation or requesting a reboot).



The screenshot shows the 'Telemetry' interface. At the top, there is a location dropdown set to 'All'. A message in the center states: 'This list is configured to update automatically every minute. Click the button to the side to update manually.' Below this, a message says 'no equipment available' with a refresh icon.

8.3. Operating Diagnosis

The evaluation of the operation of ITSCAMPRO can be verified through the system logs. This log displays all operations done by the system in the background. The main function of this log is to assist the development team in the analysis of anomalies that may occur in the system.

8.4. ITSCAMPRO Update

ITSCAMPRO has four software packages, which can be updated individually. The process is totally done in the background, after sending each update file, following the correct sequence. However, it is recommended to back up the data before the update process.

When accessing the *System > Maintenance* menu, install the packages in the order indicated by dragging the file to the *Versions* area or clicking the link to search for a saved file. Named files must be installed in the correct sequence:

- 1) *itscampro-db_1.16.0.swu*
- 2) *itscampro-system_1.16.0.swu*
- 3) *itscampro-service_1.16.0.swu*
- 4) *itscampro-web_1.16.0.swu*

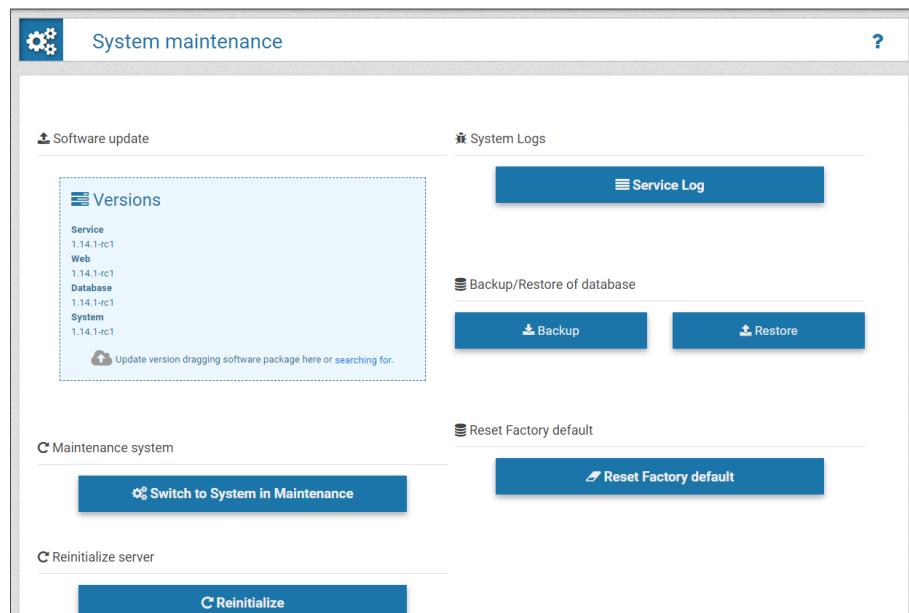


Figure 36 - Software update option on the System Maintenance screen

8.5. Backup and Restore

ITSCAMPRO enables the creation of complete system backups. The backup files generated are saved in a proprietary format and can only be used by ITSCAMPRO.



System Restore: When restoring a database in ITSCAMPRO, all information that was stored on the equipment (including internal references to the images) will be overwritten.



Factory Restore: When you restore an ITSCAMPRO installation to the factory version, all information that was stored (including images) will be erased.



ITSCAMPRO Restart: Requesting ITSCAMPRO restart causes all connections to image capture devices to be interrupted while the server and service are re-established, and vehicle recognition may be lost during this period.

9. General Conditions of the Warranty

Pumatronix guarantees the product against any defect in material or manufacturing process for a period of 1 year from the date of issuance of the invoice, provided that, at the discretion of its authorized technicians, a defect is found under normal conditions of use.

The replacement of defective parts and the performance of services resulting from this Warranty will only be carried out at the Authorized Technical Assistance of Pumatronix or a third party expressly indicated by it, where the product must be delivered for repair.

This Warranty will only be valid if the product is accompanied by a *Maintenance Form* duly completed and without erasures and accompanied by an Invoice.

9.1. Situations in which the Product Loses the Warranty

- 1) Use of software/hardware not compatible with the specifications in the Manual;
- 2) Connection of the product to the power grid outside the standards established in the product manual and installations that present excessive voltage variation;
- 3) Infiltration of liquids from the opening/closing of the product;
- 4) Damage caused by natural agents (electric discharge, flood, sea air, excessive exposure to climatic variations, among other factors) or excessive exposure to heat (beyond the limits established in the Manual);
- 5) Use of the product in environments subject to corrosive gases, with excessive humidity and/or dust;
- 6) Show signs of security seals tampering;
- 7) Show signs of opening and modification made by the Client in places of the product not authorized by Pumatronix;
- 8) Damage caused by accidents/falls/vandalism;
- 9) Display tampered and/or removed serial number;
- 10) Damage resulting from transport and packaging of the product by the Client in unsuited conditions;
- 11) Misuse and not in accordance with the Instruction Manual.

10. Privacy Policy

In compliance with the Brazilian General Data Protection Law (LGPD) - Law No. 13,709 dated 14 August 2018, this product has programmable functions for capturing and processing images that may infringe the LGPD when used to capture personal data together with other equipment.

Pumatronix is not responsible for the purposes, use and treatment of stored images, and the control of information and ways of operating the product are the exclusive decision of the user or purchaser of the product.





PUMATRONIX

www.pumatronix.com

