Embedded System for Automatic Number Plate Recognition

Software Programming and User Guide

Version 5.09

Table of Contents

Conventions Used in this Document

Generic Note: General information on how to use the system.

Warning: Specific suggestions that may as well refer to security matters.

Document Revisions

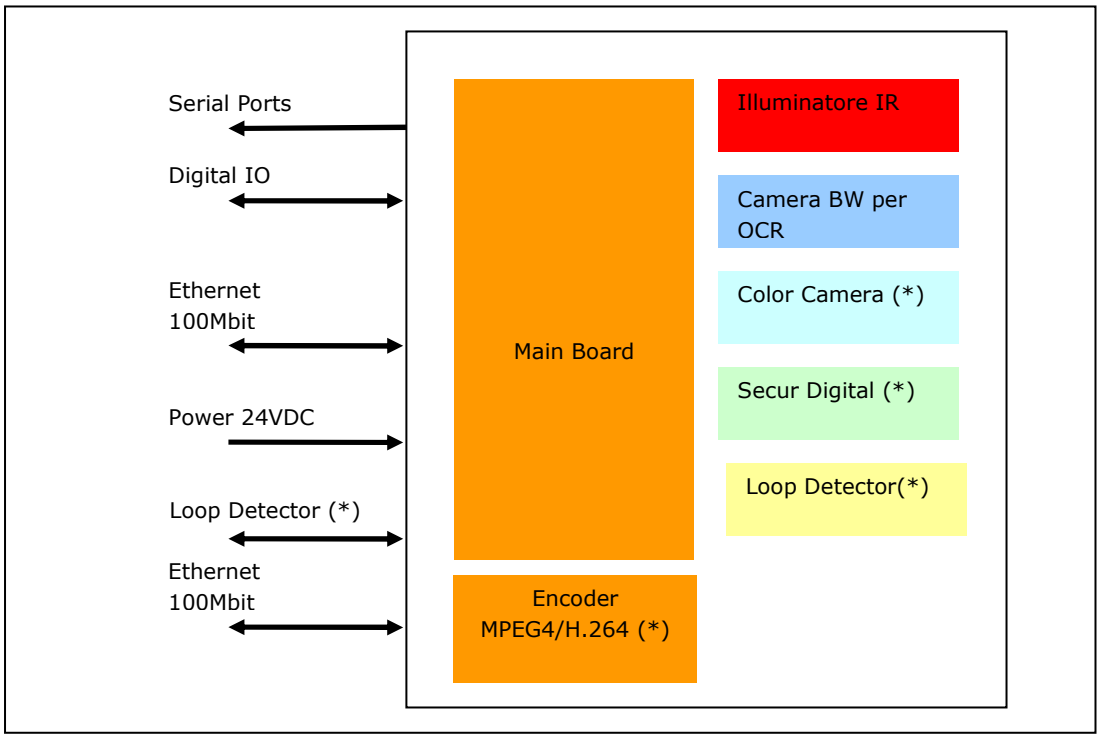
Document Revisions		
Version	Date	Comment
4.29	17 August, 2007	
5.00	1 October, 2007	Aligned with firmware version 4.29
5.01	29 January, 2008	Updated page on Live video with 4 working points.
5.02	30 January, 2008	Added info on Ethernet trigger.
5.03	25 November, 2008	Aligned with firmware version 5.22 Added documentation on VRC server TCP message.
5.04	20 December 2008	
5.05	13 January 2009	Remove notes
5.08		Fixed VRC protocol documentation (Grab image and Trigger Ethernet). Added command to get TCP error counter Fixed Countiry codes. Added OCRSCORE in TCP Message buffer Added possibility of a char separator between group of characters into plate string Added possibility to put TCP message after FTP actions
5.09	02 December 2010	Fixed a bug on grab image protocol: datasize on data buffer was wrong

VEGA Features

VEGA is a family of by Tattile for automatic car plate readers.

VEGA is suitable for parking lots and limited traffic areas surveillance, traffic monitoring and free traffic statistics.
The system is highly integrated and contains the following components in a single casing:

- Black and white camera for car plate number reading.
- Color camera (*)
- Processing board for real time OCR reading and service and user interface management.
- Infrared Illuminator (IR)
- Secur Digital memory (*)
- Speed detection and vehicle classification system based on loops (*)
- Digital input and outputs
- Ethernet interface
- RS-232 e RS-485 serial ports
- (ONLY for Vega 2H) Encoder MPEG4/H264 for color streaming video



(*) Available with specific models only.
For a detailed description of each product specifications and available optional features, please see the Installation Guide.

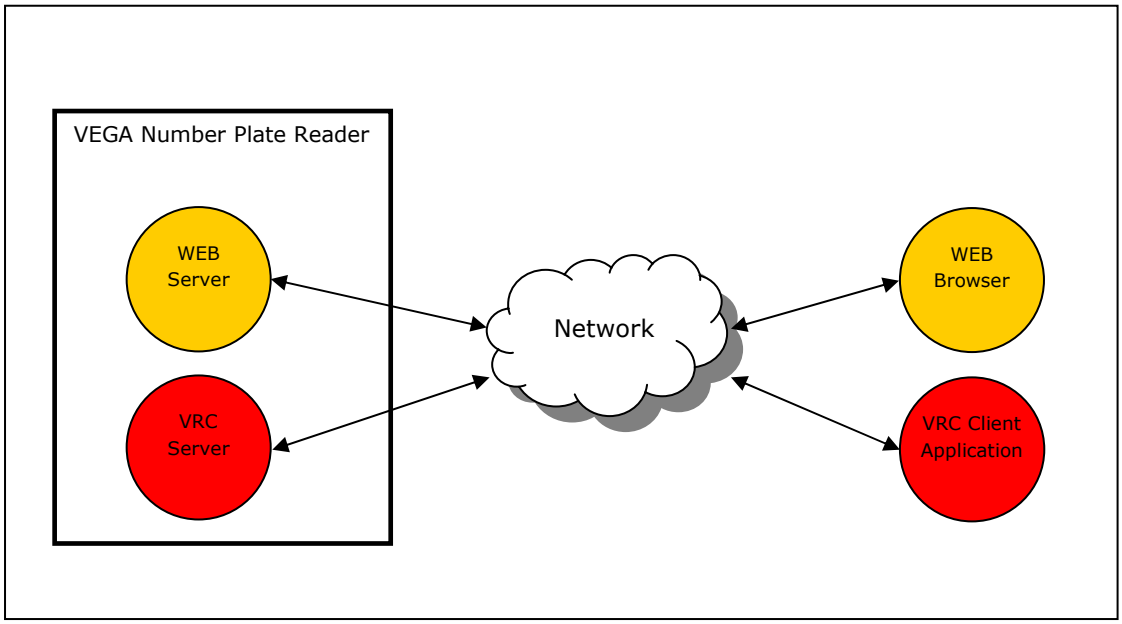
VEGA unit configuration

VEGA system configuration is set using the Ethernet interface. Two modes are available:

- Using VEGA embedded web server.
- Using VEGA embedded VRC server.

If configuring the VEGA system using the web server, a web browser (such as Firefox, Internet Explorer, Opera or others) is required to access the unit.
This Guide describes all features available from VEGA web server.

When working with complex systems with automated device supervision, a VRC (VEGA Remote Control Server) is used in order to integrate and control the VEGA unit. This server provides for several services that can be accessed through a TCP-IP socket connection. This Guide provides a detailed description of how to access the VRC server.



Receiving Data from VEGA unit

VEGA operates as Client unit. Upon detecting an event, it sends data to a remote server.
Several operating modes are available, which can operate simultaneously as well.

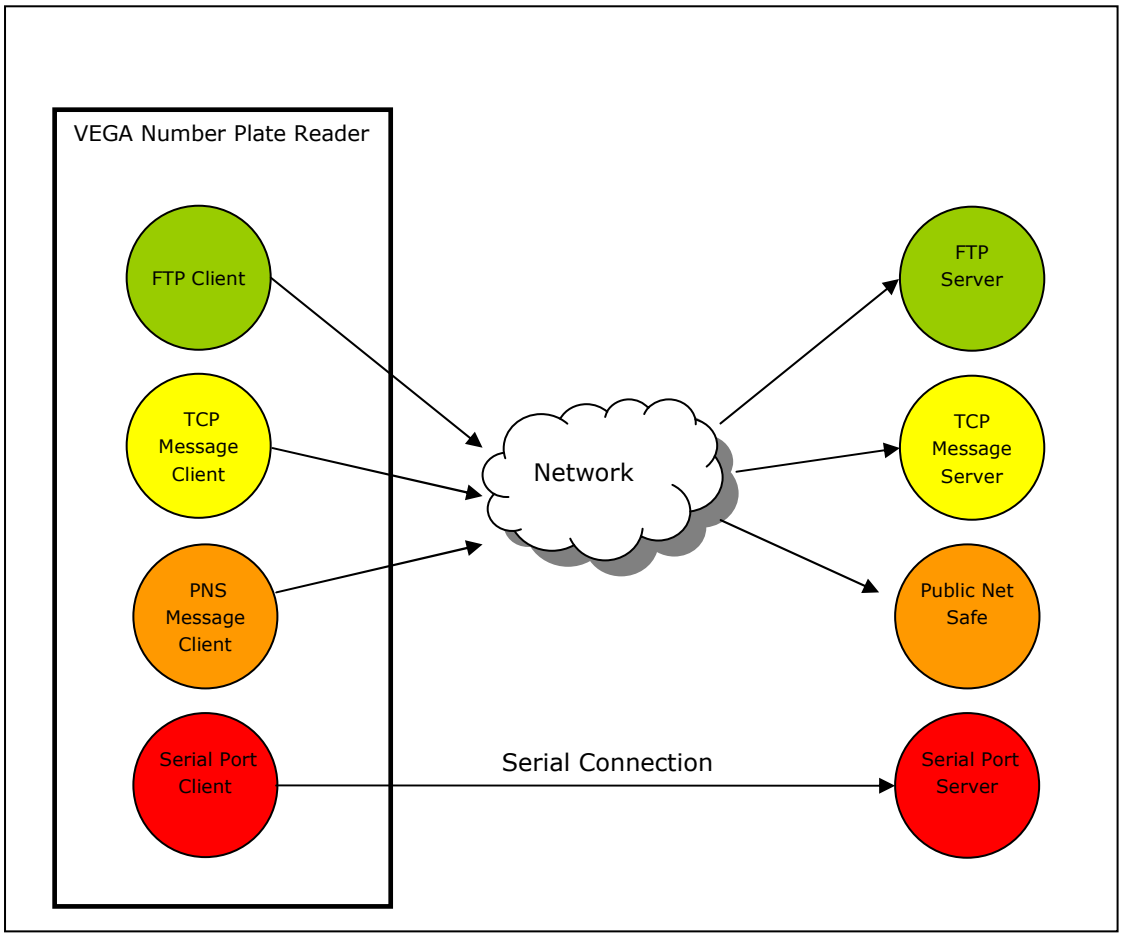
- Ethernet Network: VEGA operates a FTP Client.
- Ethernet Network: VEGA operates as Client using Tattile protocol on TCP-IP socket (TCP Message Mode).
- Ethernet Network: Messages to PNS (Public Net Safe) software.
- Serial Ports: Messages are sent to serial ports.

In FTP mode, the user must have an FTP server where VEGA will send data and/or images. For further details, please refer to relevant section in this Guide where events/actions available on VEGA systems are presented.

In TCP-Message mode, the user must develop a server capable of receiving data to TCP-IP socket. For details on data format and how to use this feature, please see "Send Messages to TCP-IP socket" section in this Guide.

In both modes, the data to be sent, the name to be assigned to images, the path for saving etc. – are all configurable using VEGA web interface.

The chart below shows the available modes for data exchange:



Some models of the VEGA family come with embedded secur digital (SD) memory. If data sending is not possible, for instances when network communication is not available, data are automatically archived to SD. Data are then automatically retrieved from SD and sent once the connection has resumed.
For details, please refer the section describing SD management. For VEGA models with embedded SD memory please refer to the Installation Guide.

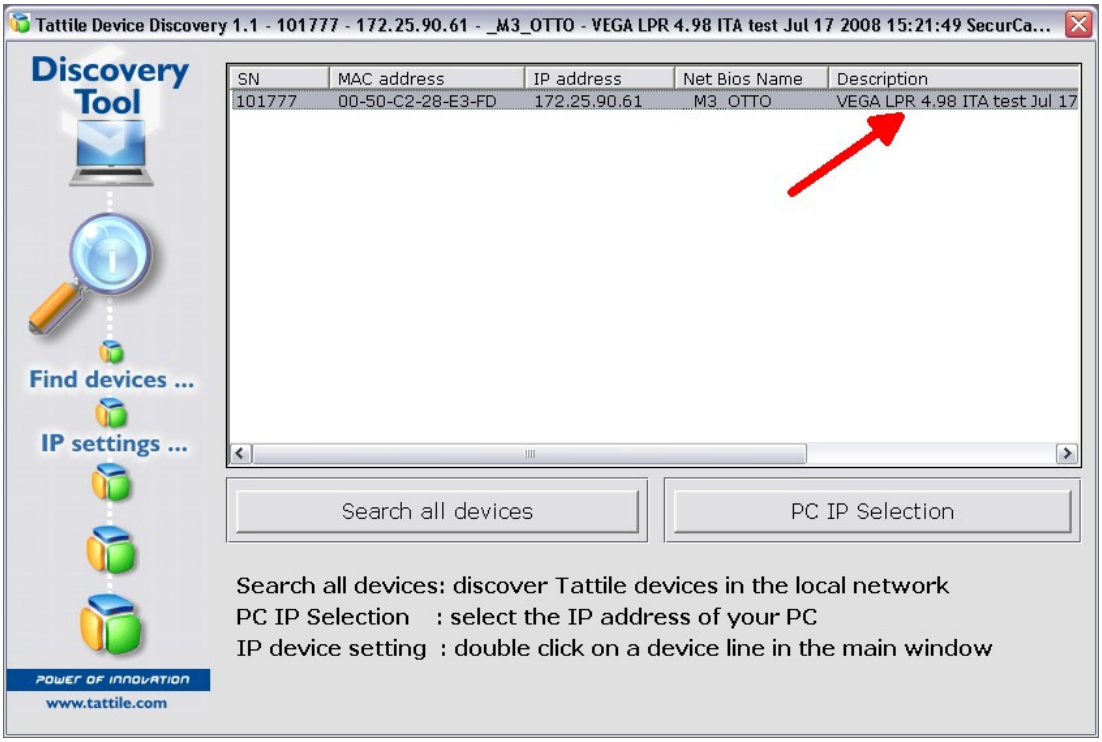
Using the Web Server

VEGA IP address must be known in order to access its web server.

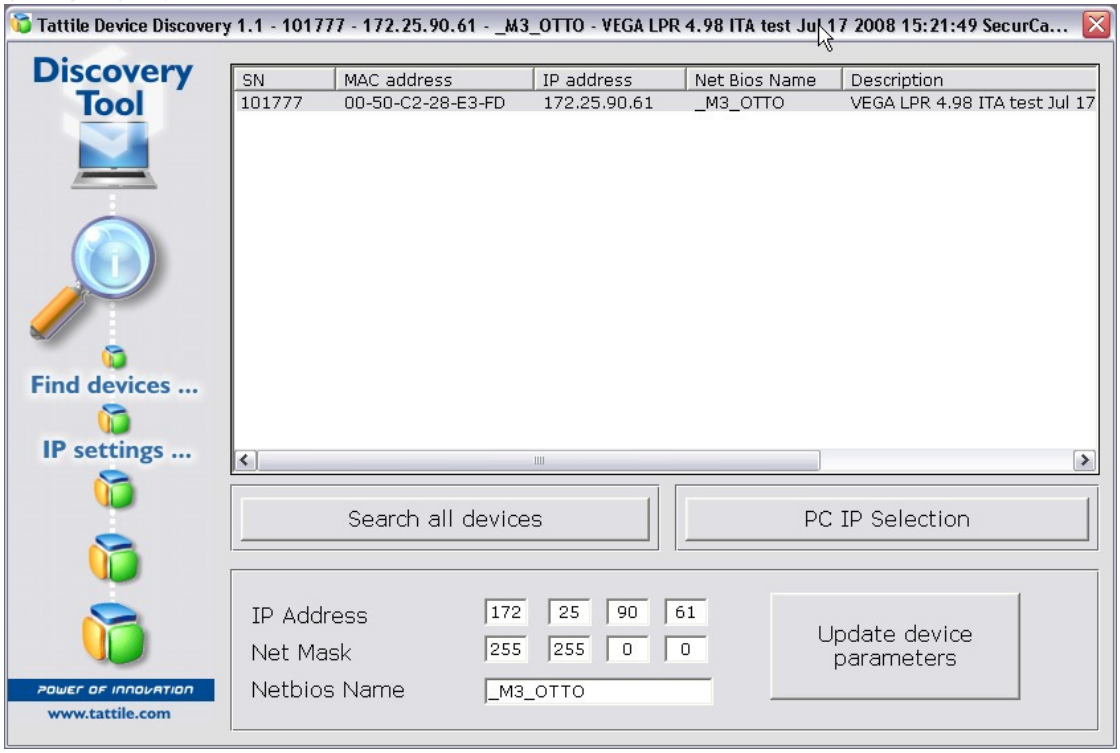
Tattile developed the TATTILE DEVICE DISCOVERY (TDD) software. TDD allows searching the LAN network for Vega machines that are connected and active. This search does not depend on the network configuration of the PC where the TDD is being carried out.
This means it is not necessary to define any network settings for the PC since the program operates in broadcast mode.

The TDD application is downloadable from the Download Area at www.tattile.com.

In addition, the TDD allows setting the IP, the Netmask e the NetBiosName of each machine.

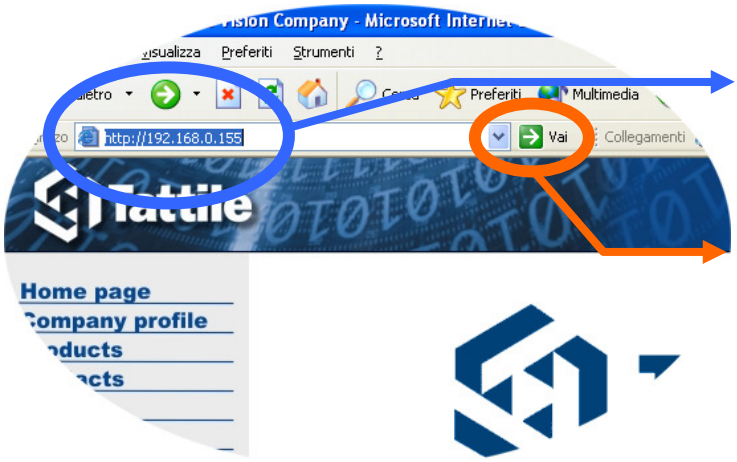


To access the change settings section, double click on the row of the relevant device:



User Authentication

Prior to accessing the number plate reading unit using a Browser, make sure the PC network configuration is coherent with the IP address of the device to access. For example: if the VEGA machine IP address is 192.168.0.100, the PC in use should be temporarily assigned an IP address belonging to the same class (e.g. 192.168.0.200). Alternatively, use the TDD to modify VEGA IP address.



Once the static IP address of the VEGA unit has been retrieved, **type the numeric sequence in the navigation address bar** of the browser in use and either press Enter from the keyboard.

The **Login Window appears** where the User is asked to type in his/her **Username** and **Password**.

Note: Factory-assigned user name and password are as follows:
User Name: **superuser**
Password: **superuser**

Warning: For best access security, once the device has been installed please change the factory-assigned username and password (see HTTP Users Settings).

Access Levels

Three user categories are available:

- **Superuser**
- **Administrator**
- **Guest**

These three User Levels differ in such that:
The **Superuser** is allowed to access all system-enabled features, modify operational parameters (set-up) and assign access rights to other VEGA users.

The **Administrator** user, unlike the Superuser, has no right to modify the user settings, and is therefore not allowed to access the HTTP users' page described later in this page.

The **Operator** user is only allowed to view the system parameters, HTTP users page not included.

Main Web Page

If login was successful, the User is now able to access the program main menu screen.
The main page shows two sections: Plate Reader and System (link in the left side of the page).
The icons vary according to the VEGA model in use while the software is the same for all devices of the VEGA family. The software can detect its hardware platform and thus dynamically generate its web interface.

Plate Reader contains the following features:

- **General:** VEGA general settings, enabling and stand-by mode selection.
- **Camera OCR:** This page relates to the black/white image camera used for car plate reading. In this page it is possible to view a live video and its image grabbing parameters on VEGA, and to save and export the displayed image.
- **Camera Context:** This page displays the color image-grabbing camera used for shooting context images. This icon only appears in the web interface of VEGA models with Context Camera feature.
- **Vega Context:** A different icon is displayed for machines that don't have a context camera. Click on this icon to use a context camera which is separate from the Vega device and is connected via Ethernet. For details, please see the Context Camera section.
- **Plate Reader:** This page contains the settings of plate recognition parameters (minimum and maximum character size, plate searching area, time integration i.e. the duration of a vehicle transit, image selecting mode etc.).
- **Digital Trigger:** The settings of the digital inputs for external trigger interfacing (such as passing-by vehicle magnetic loop detectors, photo sensors etc.).
- **Check List:** The settings of the lists of vehicles that are authorized/not authorized to pass through the gate monitored by the unit. Two lists are available, which can be used as generally as possible. Typically, the first list would include authorized vehicles. The second list

may include those vehicles that require a different event management, such as an alarm generation.

- **Events Actions:** The settings of the actions the machine takes that are appropriate for the detected event. For example: Send image to an FTP server when the plate number was recognized, or activate a digital output when the recognized plate number belongs to either one of the plate list in use).
- **Image Results:** This page displays the last selected image of a vehicle transit. Helpful when monitoring the system real time performance.
- **Text Results:** This page displays the partial results from a vehicle transit.
- **Statistics:** This page displays the statistics of the VEGA car plate reading machine (the statistics refer to the last 24 hours of operating).

System contains the following features:

- **Network:** The settings of Network configuration and Time synchronization through Time Server (SNTP Protocol).
- **HTTP users:** The configuration settings for users who use a browser to access the machine.
- **Log Files:** The settings for generating a log file automatically sent to a remote FTP Server.
- **Serial Ports:** The settings of the serial ports (COM) of the machine: through such ports the VEGA car plate reader sends transit data and plate readings to an external unit. These parameters relate to baud rate, stop bits etc.
- **Firmware:** This page displays the commands for updating the machine to the latest software release and extracting the configuration to be automatically copied to another unit.
- **Device Info:** This page displays info about the system hardware configuration and firmware versions.
- **Activation Code:** This page is used to activate the licenses of the car plate reading software libraries. By default, each VEGA machine comes with 1 activated license.
- **Sys Statistics:** Statistics on transfer pass bands to remote servers and statistics on synchronicity of SNTP time synchronization.
- **Secure Digital:** (ONLY for VEGA 2H, VEGA PLUS, Vega Access), status and available space over internal SD memory .

How to use the VRC (Vega Remote Control) Server

This paragraph describes how to use VEGA embedded VRC server, available as of firmware version 4.35.

All requests sent from the VRC client are always supposed to receive an acknowledge message from the VRC server. Communication is based on TCP protocol. VRC server communication port is port 31000.

The VRC Client must wait for an acknowledgement message from the server before sending next message. The response message may be either a simple receipt acknowledgement or a message with the data that client had requested. Waiting time for acknowledgment is defined at Client VRC application level.
Each message contains a header, which is created in such a way that each message is an object that contains all data required for processing by the receiver.

Data format always complies with the structure shown below, both for sent and received messages.

Client-server Generic Message		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	
4	Sender	
4	Receiver	
4	Error	
4	DataDimension	MSG_SIZE
MSG_SIZE	Message to send	

This data structure is called CommandHeader, "Message To send" excluded.

CommandHeader: Field Descriptions	
Header Dimension	Size in bytes of the header. It is always set to 24.
CommandCode	Identification code of the command sent to the server
CameraID	The Vega family includes dual-camera products (typically, one B/W camera and one color-camera). This field indicates to which camera the sent message is to be associated with. In case the message does not refer to a specific camera (as with messages for reading the video camera files), this field must be set to 0xFFFFFFFF from the VRC client.
Receiver	Upon sending, VRC client must set this field to 0xFFFFFFFF
Error	Upon sending, VRC client must set this field to 0. In messages received form VRC client, this field contains the error code generated by VRC server.
DataDimension	Size in bytes, 32-bit aligned, of the data to be sent after the header (header size is not included).

The protocol can handle both sent and received messages of any length. The only restraint imposed is 32-bit alignment (where MSG_SIZE must be in multiples of 4 bytes).

Transmission to VRC Server

During transmission, the following actions are to be executed:

- Add the CommandHeader header to the message. If there is no data to send, the message is made up by the CommandHeader header only. The DataDimension field should also be set to zero.
- Enter the command code in the CommandCode field. (For a detailed list of command codes, please see later in this document).
- Send the message.

Receiving from VRC Server

During reception, the following actions are to be executed:

- Wait for the first message packet and extract the CommandHeader header.
- Wait, if needed, for the next packets until MSG_SIZE bytes are received. Waiting time for each packet is set at application level.
- Create a contiguous data buffer that will contain the received message.
- Check whether the **Error** field in CommandHeader contains any error code. If so, the message data it contains are not valid.

Sent and Received Messages Formatting

Sent and received data that follow the CommandHeader header must comply with a specific formatting. Each datum is identified by a code and is followed by a field with the size of the data that are about to be sent or received.

Message Generic Datum		
Nr of bytes	**Description**	**Value**
4	DataCode	
4	DataSize	DATA_SIZE
DATA_SIZE	DataBuffer	

This data structure is called DataHeader, DataBuffer excluded. The message may contain any number of DataHeaders. Inside the messages received from VRC client, DataHeaders are arranged in the same way according to VRC server firmware version. This may as well change when using a different firmware version. For this reason, when searching for Dataheaders in the packets received, the VRC client software will scan all DataHeaders regardless of their position inside the received message. This programming method allows for software compatibility with future VRC server firmware versions.

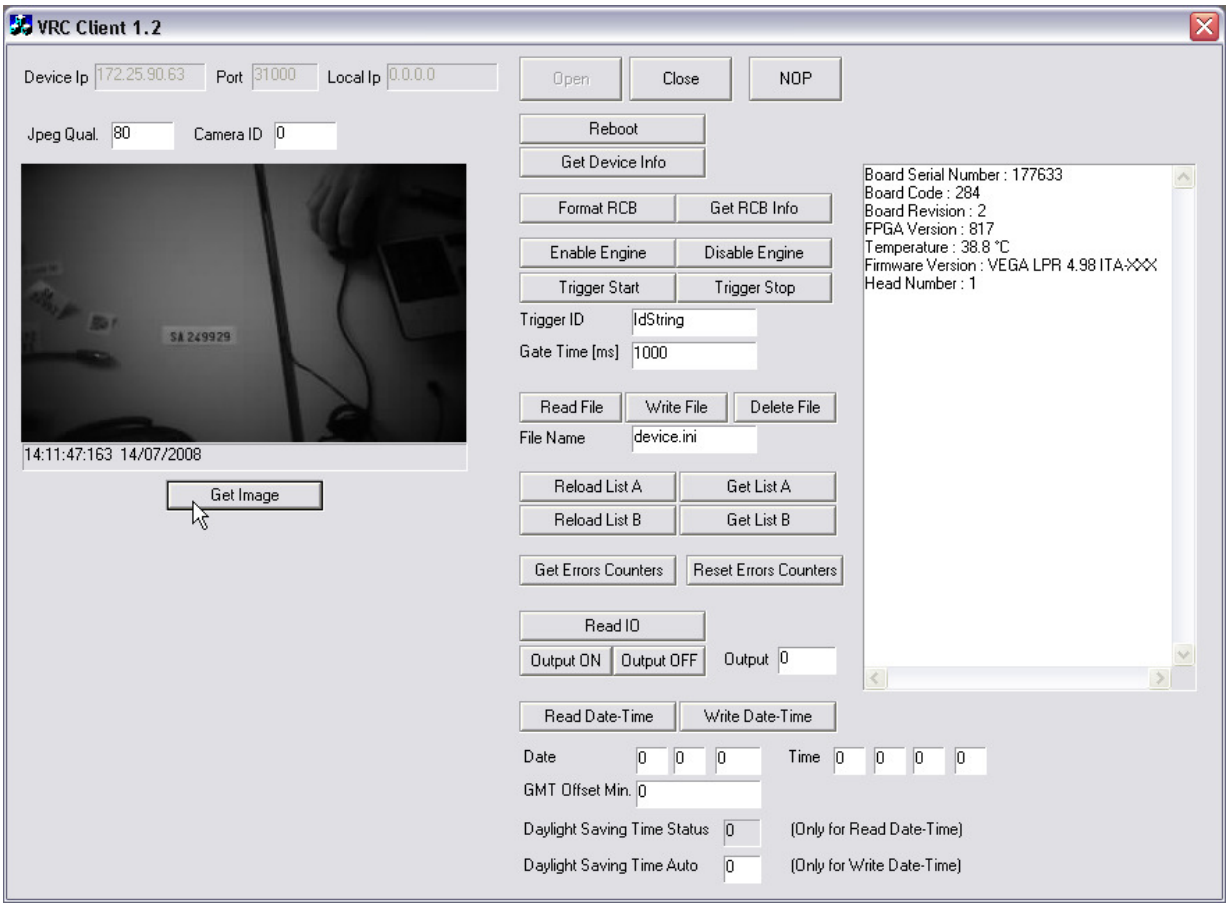
TCP-IP Connection Management

If the TCP connection is unused (i.e. no data sent from client to server) for more than 5 minutes, the VRC server automatically shuts the connection. The connection remains open if the client sends a periodic message whose period is not shorter than 5 minutes. This message is the only type that does not require any acknowledgement by the VRC server.

No Operation *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	25150
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Developing a VRC client in Visual C++ 6.0 - Example

A VRC client in Windows Visual C++ 6.0 was developed that makes application testing and developing easier. Client VRC implements all functionalities as they are described in this Guide. Tattile provides for the source code of this project.



All CommandCodes and DataCodes in the messages used in this document are grouped in the VRC-Codes.h of the VisualC sample project.

Tattile provides some DLLs that make VRC client developing in Windows easier. For detailed examples on how to use these features, please refer to the source code of the VRC client sample project.

Available functionalities allow the following:

- Manage the TCP connection to VRC server Data sending and receiving.
- Build data packets to be sent, based on the DataHeader structure
- Search for the requested data in the received data packets, based on DataCode

Manage TCP Connection

itf_interface.h

```
HANDLE   itf_Open              (ITF_OpenParameter *op, long timeOut);
long     itf_Close             (HANDLE *chHandle);
long     itf_SetParameter      (HANDLE chHandle, long code, const void *value, long size);
long     itf_ChannelStatus     (HANDLE chHandle, long timeOut);
```

Send and Receive Data

itf_SecurCam.h

```
long SC_send_command      (HANDLE chHandle, long command, long wait_answer);
long SC_send_long         (HANDLE chHandle, long command, long value, long wait_answer);
long SC_send_buffer       (HANDLE chHandle, long command, void *pUserData, long UserDataSize, long wait_answer);
long SC_receive_long      (HANDLE chHandle, long command, long *value);
long SC_receive_buffer    (HANDLE chHandle,long command,void **pUserData, long *UserDataSize);
long SC_send_receive_buffer(HANDLE chHandle,long command,void *buffer_tx,long buffer_tx_size,void **buffer_rx, long *buffer_rx_size);
```

Build Data to be sent

itf_SecurCam.h

```
long SC_add_string  (void **pBuffer, long *BufferSize, long *BufferSizeUsed, const TCHAR *str, long code, BOOL AllowRealloc);
long SC_add_long    (void **pBuffer, long *BufferSize, long *BufferSizeUsed, long value, long code, BOOL AllowRealloc);
long SC_add_buffer (void **pBuffer, long *BufferSize, long *BufferSizeUsed, void *pdata, long datasize, long code, BOOL AllowRealloc);
```

Extract Received Data

itf_SecurCam.h

```
long     SC_extract_long      (long *value, ULONG code, void *pData, long DataSize);
long     SC_extract_buffer    (void *pBuffer, long BufferSize, long *DataWritten, long code, void *pData, long DataSize);
long     SC_extract_string    (TCHAR *pStr, long StrSize, long *DataWritten, ULONG code, void *pData, long DataSize);
long     SC_extract_image     (Tbanco **pbanco, ULONG code, void *pData, long DataSize);
```

All functionalities - except for itf_Open() - return 0 if operation was successful and a value other than zero if action failed.

Events and Actions

VEGA engine software generates a series of events. It is possible to associate one or more actions to each event.

Using WEB pages

A graphic matrix in the web interface is used to plan the actions required for handling the generated kind of events.

The icon of access to the configuration matrix is shown below here:


Events Actions

The configuration matrix of the actions is shown below here:

Events/Actions Settings

Events / Actions	Save Image	Save DB	PNS Alarm	Pulse Out	232 Msg	485 Msg	TCP Msg	SD Saving
OCR Read								
OCR Not Read								
OCR No Plate								
Match on List A								
No Match on List A								
Match on List B								
No Match on List B								
Start Trigger								
Stop Trigger								

The left column contains the list of events the system generates:

- **OCR Read:** This is the car plate that has been read
- **OCR Not Read:** This is a car plate that has been partially read. By partially read we mean that groups of character were read that do not comply with any syntax supported by OCR libraries of the version in use. Typically, an OCR Not Read event is generated when the detected car plate does not belong to any Country of Origin the firmware version can actually read or when the car plate can't be properly read due to dirt or damage.
- **OCR No Plate:** This is an image containing no plate number – this kind of event is generated in trigger mode only. For a more detailed description of the various available operating modes, please see the next paragraphs in this Guide.

- **Match on List A:** This is a car plate number that has been read and recognized as belonging to list A.
- **No Match on List A:** This is a car plate number that has been read and has no match on list A.
- **Match on List B:** This is a car plate number that has been read and recognized as belonging to list B
- **No Match on List B:** This is a car plate number that has been read and has no match on list B
- **Start Trigger:** This is the Start Trigger event (either a digital or Ethernet I/O trigger).
- **Stop Trigger:** This is the Stop Trigger event (either a digital or Ethernet I/O trigger).

This matrix may contain the following symbols:

It indicates that when dealing with a certain event, the corresponding action is enabled.

It indicates that the action was deactivated.

In case the event/action pair is not possible, the matrix will show no symbol.

In order to **enable**, **disable** or **configure** an event action, it is sufficient to click the box corresponding to the check or uncheck symbols, as shown above. This will access the User to the Configuration page that contains all action parameters and allows enabling/disabling the action itself.

The Configuration page allows setting each action parameters using configuration TAGS i.e. strings starting with a % symbol. Click the context HELP buttons in each web page to view the available TAGS.

VEGA firmware understands the TAGS and translates them to their corresponding value. For instance: let's think of how to form the name of the file to which the image will be saved. If the file name was set to %PLATE and the car plate is HG542ER then the file name is HG542ER.JPG (if image is saved to JPG format).

%PLATE → HG542ER.JPG

When using TAGS not provided by the software, they are not translated and are left unchanged. For example, the %TEST tag is not supported, so that:

%TEST%PLATE → TESTHG542ER.JPG

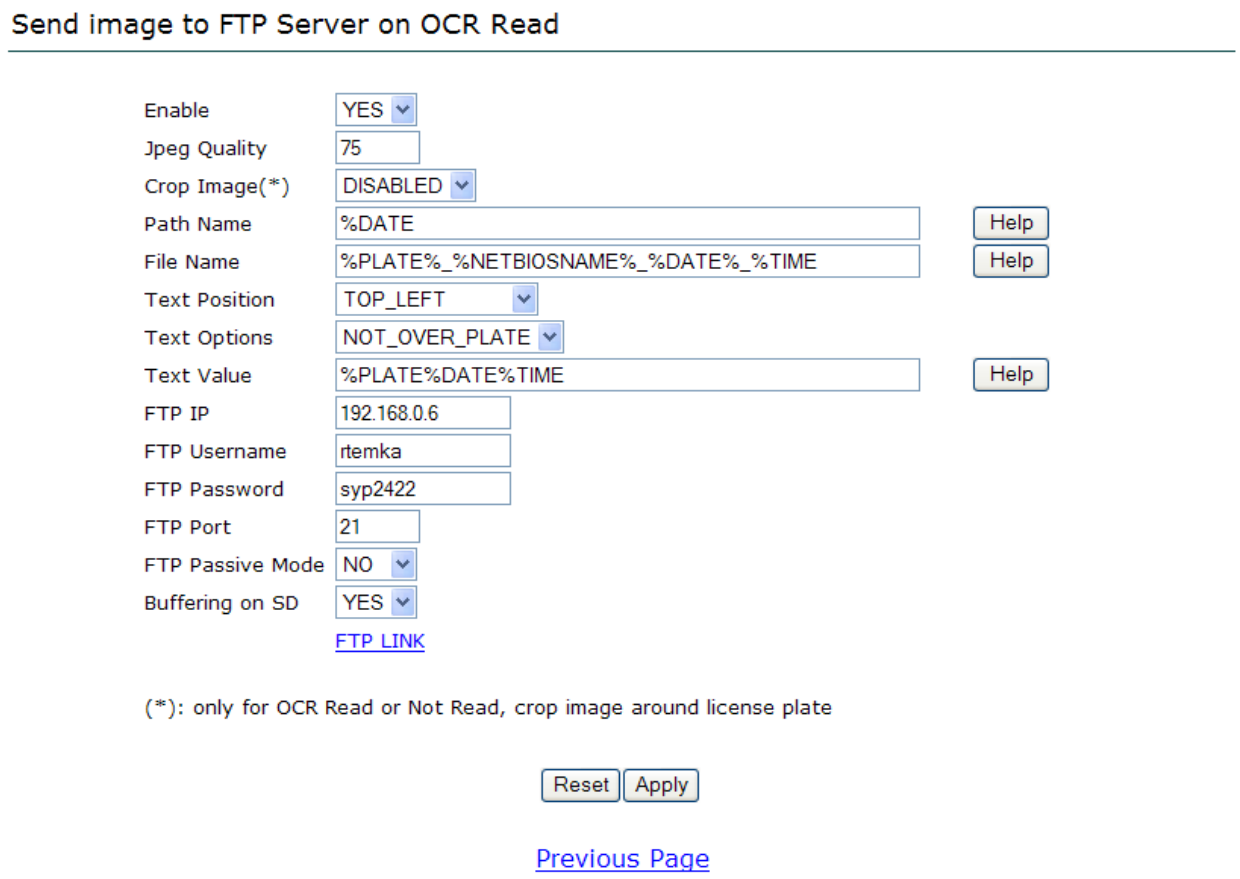
Separators, such as the '_' character, are handled as unknown tags so it is possible to use them to separate file name components.
For example:

%TEST%_%PLATE → TEST_HG542ER.JPG

The available actions and their detailed descriptions are given below:

Save Image to FTP Server

This action corresponds to the **Save Image column**. If enabled, this function allows saving to a remote FTP server the images of vehicle transits detected by the car plate reader. When the context camera is provided for and is enabled, two images per transit are saved. The context image file name has a distinctive _CTX suffix. This does not depend on whether the VEGA unit has a context camera or whether you are using an external context camera synchronized with VEGA through the network (Vega Network Context).



Enable: This parameter takes two possible values: YES or NO. If enabled (YES), this feature allows saving the image of the event.

Jpeg Quality: The values may range from 1 to 100 where 1 is the maximum compression level (lowest quality) and 100 is the minimum compression level (highest image quality).
Suggested values from 50 to 90.

Example of high quality (90) JPG image.

Example of low quality (5) JPG image.

Crop Image: This feature is available as of software version 5.22. This setting allows sending to an FTP server a crop of the full image. Such crop is cut around the car plate. Available sizes: 320x240, 640x480, 800x600 and 1024x768.
Sending an image crop instead of the full image saves space on the storage server and cuts down on transmission time on the network (this is useful when working with low pass band networks).

Path Name: It allows specifying the folder name where the car transit image is saved.
It is necessary to use appropriate tags to indicate this folder name.
For example, use the "%DATE" tag in order to use the date of grabbing as folder name.

In case the specified directory path does not exist on the FTP server, the VEGA unit automatically creates it.

In case the path name is "%DATE", when the date changes the VEGA system dynamically creates a new folder corresponding to the current date.

File Name: It allows specifying the name to assign to the vehicle transit image to save.
It is necessary to use appropriate tags to indicate this file name.
For example, use the "%PLATE" tag in order to insert the read car plate in the name

Text Position: It allows specifying the position of a text window inside the saved image. This window contains the information entered in Text Value. The allowed values are: TOP_LEFT, TOP_RIGHT, BOTTOM_LEFT, BOTTOM_RIGHT and DISABLED.

Text Options: It allows to enable the option NOT_OVER_PLATE. This option move automatically the text window when positioned over the plate, in order to not cover the plate.

Text Value: It allows specifying information to be included in the image, whose position is indicated in Text Position.
It is necessary to use appropriate tags to provide this information.
Available tags are made up by the character "%" followed by a string. For example, use the "%DATE" tag in order to save the image containing the acquisition date.
Upon inserting any tag, a new caption is added above the image, as shown in the image below:

Text Options: It enables the NOT_OVER_PLATE feature. This option automatically moves the overwritten captions whenever they overlap the car plate so that the car plate remains well readable.

FTP IP: The IP address of the FTP server.

FTP Username: The username of the FTP server user.

FTP Password: The password of the FTP server user.

FTP Port: The port of the FTP server.

FTP Passive Mode: It allows to enable (YES) the passive modality (PASV) for data transfering.

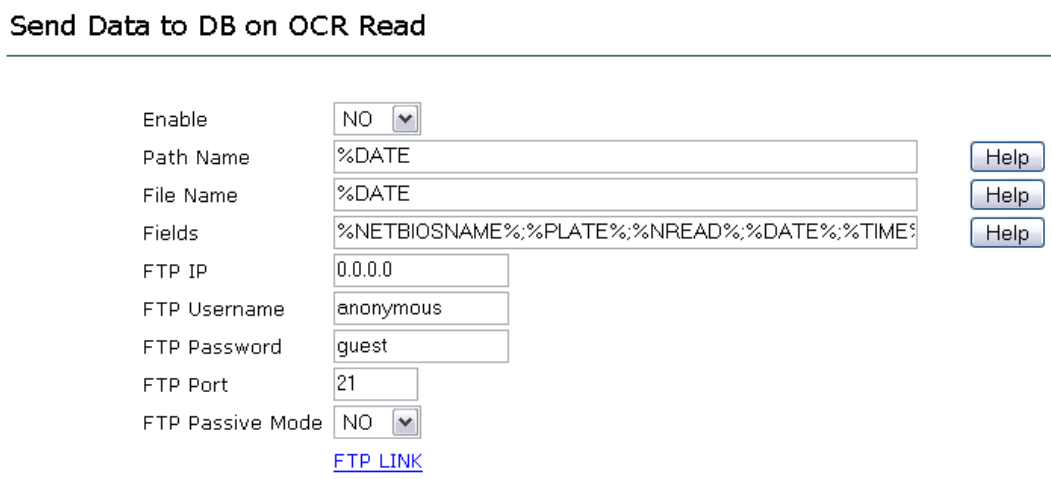
Buffering on SD: (ONLY for VEGA 2H, VEGA Plus, Vega Access), in case of network failure and Buffering SD enabled, the camera is able to save automatically all data regarding the actions to perform over the network (FTP Save image, Save DB, etc…). The saving is based over a circular buffer. When the network is newly avaiable the camera will manage automatically all data stored, freeing the memory. Incase of full memory the camera will overwrite oldest data.

FTP LINK: By clicking on the blue hypertext, it is possible to directly access the address of the Server where images are saved. This hypertext automatically shows the parameters entered in the FTP IP, Username, Password and Port fields. This link is useful to check whether the FTP server is operating properly.

Saving Text Messages to FTP Server

Using the WEB pages

This action corresponds to the **Save DB column** of the matrix. If enabled, this feature allows creating and automatically updating on a remote FTP site a text file in CSV format (CSV – Comma Separated Values) containing information about every vehicle transit detected by the VEGA plate reader.



Enable: It takes two possible values**:** YES or NO. If enabled (YES), this feature allows updating the database with the information about the vehicle transit.

Path Name: It allows specifying the folder name where the database is saved. It is necessary to use appropriate tags to indicate this folder name. For example, when using "%DATE", a new folder is created each day.

File Name: It allows specifying the name of the database to be updated with the data about vehicle transit. For example when using %DATE a new file is generated each day. The file name is the date on that day – e.g.: 2008-10-28.CSV

Fields: It allows specifying the database fields.
For example:

String on web interface:

```
%DATE%;%TIME%;%PLATE%;%IMAGENAME
```

CSV file on FTP server:

```
DATE;TIME;PLATE;IMAGENAME
2007-10-03;09-14-50-222;SA249BH-ITA;SA249BH-ITA_2007-10-03_09-14-50-222.jpg
2007-10-03;09-15-00-569;CH123BV-ITA; CH123BV-ITA_2007-10-03_09-15-00-569.jpg
2007-10-03;09-18-07-234;AF234SV-ITA; AF234SV-ITA_2007-10-03_09-18-07-234.jpg
```

FTP IP: The IP address of the FTP Server.

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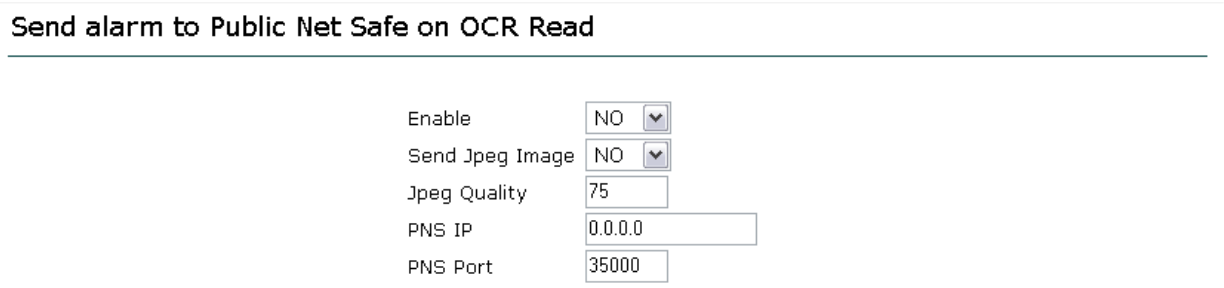
Send Alarm to PNS

PNS (Public Net Safe) is Tattile software product for monitoring and integrating Tattile surveillance video systems.
PNS includes a service for receiving messages from systems of the VEGA family. This service allows archiving the received messages and displaying a popup window when the message is being received by PNS.

Using the WEB pages

It allows sending a message to a PC with PNS installed.



Enable: It takes two possible values: YES or NO. If enabled (YES), this feature allows sending the message.

Send Jpeg Image: It takes two possible values: YES or NO. If enabled (YES), this feature attaches to the message an image of the transit event (in JPEG format).

Jpeg Quality: This field shows the quality value to use when sending the JPEG image. The allowed values range from 1 to 100.

PNS IP: The IP address of the PC to which the alarm message will be sent.

PNS Port: The port to which the PNS service will receive messages. Its default value is 35.000.

Buffering on SD: (ONLY for VEGA 2H, VEGA Plus, Vega Access), in case of network failure and Buffering SD enabled, the camera is able to save automatically all data regarding the actions to perform over the network (FTP Save image, Save DB, etc…). The saving is based over a circular buffer. When the network is newly avaiable the camera will manage automatically all data stored, freeing the memory. Incase of full memory the camera will overwrite oldest data.

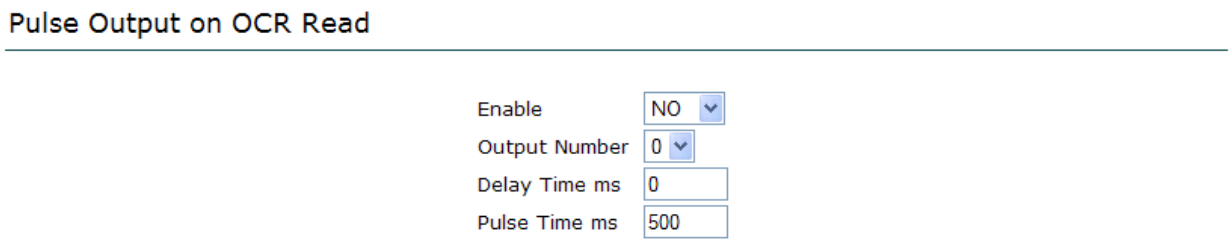
Pulse Out

Using the WEB pages

It allows activating any of Vega digital outputs over a specified period of time.

Note: VEGA machines are equipped with an internal I/O circuit with control outputs for direct management of electrical devices (such as LEDs, sound alarms, blinking, display) or electromechanical devices (such as electrical locks, motorized barriers, traffic bollards, motorized gates) associated with system-generated events.

For electric specifications of the digital inputs and outputs of the various Vega models, please refer to the Installation Guide.



Enable: It takes two possible values: YES or NO.

Output Number: Number of the digital output to be activated by the value shown in Pulse Time ms.

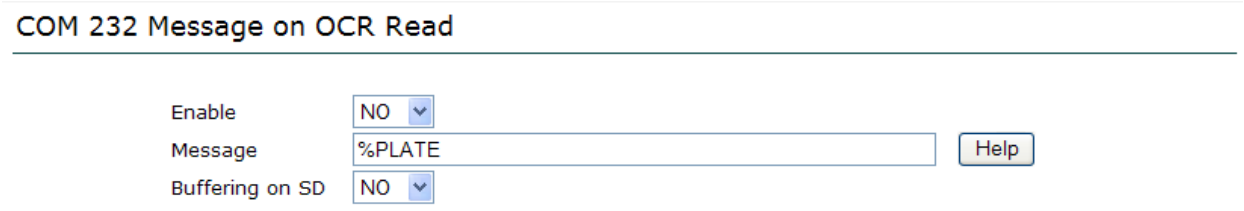
Delay Time ms: Delay to be applied prior to actual activation of the digital output on the car plate reader. This value is expressed in milliseconds.

Pulse Time ms: The time period (in milliseconds) during which the output is high.

Send Messages to RS 232 and RS 485 Serial Ports

Using the WEB pages

It is possible to send messages to 232 and 485 serial ports. These actions correspond to columns **232 Msg** and **485 Msg** of the event/actions matrix.
Tags are used to define the content of the message sent. The configuration form of a message to port 232 is shown below – use identical configuration for messages to port 485.



Enable: It takes two possible values: YES or NO

Message: This field allows specifying the syntax of the message to be transferred through the serial port.

Buffering on SD: (ONLY for VEGA 2H, VEGA Plus, Vega Access), in case of network failure and Buffering SD enabled, the camera is able to save automatically all data regarding the actions to perform over the network (FTP Save image, Save DB, etc…). The saving is based over a circular buffer. When the network is newly avaiable the camera will manage automatically all data stored, freeing the memory. Incase of full memory the camera will overwrite oldest data.

When building the data packet to be sent, it is possible to use a TAG that inserts bytes using hexadecimal decoding. This makes data packet building more flexible than when using alphanumeric characters only.
For example: in order to send the car plate number string followed by the two bytes sequence CR (carrier return) and LF (line feed) as terminators, the message field is to be set as follows:

%PLATE%0x0D%0x0A

where 0x0D and 0x0A are the hexadecimal codes of CR and LF, respectively.

Before using the serial ports, it is necessary to configure them in a web page found in the system section.
This configuration page is accessed via the icon shown below:

Serial Ports

Serial Ports Settings

COM 232		COM 485	
Enable(*)	NO	Enable(*)	NO
Baud Rate(*)	9600	Baud Rate(*)	9600
Parity(*)	NONE	Parity(*)	NONE
Data Bit(*)	8	Data Bit(*)	8
Stop Bit(*)	1	Stop Bit(*)	1
Message	RAW	Message	RAW
Wait ACK(**)	NO	Wait ACK(**)	NO
Timeout ms(**)	500	Timeout ms(**)	500
Retry Number(**)	1	Retry Number(**)	1

Reset Apply

(*) : Changes in these settings will briefly interrupt this browser connection. Refresh this screen to reconnect.
(**): Used only if Message is PROTOCOLLED.

In VegaPlus with loop detector system, port 485 is used to communicate with the loop-management card. For this reason, it is not physically available for external connections.

Settings for both port 232 and 485 are similar.

- **Enable:** It allows enabling or disabling communication through the serial port.
- **Baud Rate:** It allows specifying the serial port communication speed. The allowed values are: 2.400, 4.800, 9.600, 19.200, 38.400, 115.200 Kbps.
- **Parity:** It allows specifying the congruence check of data, performed on the parity bit. The allowed values are: NONE, EVEN and ODD.
- **Data Bit:** ***Default setting 8***.
- **Stop Bit:** It allows specifying the stop bit value. The allowed values are 1 (one) or 2 (two).
- **Message:** It allows specifying the message protocol. The available options are: *RAW* or *PROTOCOLLED*.
- **Wait ACK:** It allows enabling/disabling the confirmation signal sent by the external unit upon data receiving. The available options are: YES and NO (only when in Protocolled mode).
- **Timeout ms:** It allows specifying the time (in milliseconds) of waiting for an answer from the external unit (only when in Protocolled mode).
- **Retry Number:** It allows specifying the number of times the VEGA machine will try to resend the message to the external receiving unit (only when in Protocolled mode).

RAW format allows for full message setting using Vega web interface. Using the PROTOCOLLED format involves a super structure and an acknowledge packet, if received.

When in this mode, everything works exactly like when in RAW mode but in addition, the Vega firmware inserts a header and footer at the beginning and at the end of the message, respectively. The header contains an open message code, an ID and the message size. The footer contains a xor byte and a close message code.
Protocol definition is as follows:

Protocolled data packet sent by the Vega unit		
Number of bytes	**Value**	**Description**
1	0x89	Open Message Code - byte 0
1	0XAB	Open Message Code - byte 1
1	0xCD	Open Message Code - byte 2
1	0xEF	Open Message Code - byte 3
4	ID	Message Progressive ID
4	DataLen	Data Size in Bytes
DataLen		Data Packet
1	XOR	Xor byte of all previous bytes (DataLen+4+4+1+1+1+1)
1	0x12	Close Message Code - byte 0
1	0x34	Close Message Code - byte 1
1	0x56	Close Message Code - byte 2
1	0x78	Close Message Code - byte 3

Note: a progressive integer number starting from 1 gives ID value. Such value is augmented at each message sending. The 4 bytes in DataLen are sent starting from the most relevant byte.
Data packet contents are fully specified using the web interface.

It is possible to specify or not (using the web interface) whether an acknowledge packet should be waited for. The packet structure is as follows:

Acknowledge Packet		
Number of bytes	**Value**	**Description**
1	0xA5	Open ACK Message Code
4	ID	Message ID
1	0x5E	Close ACK message Code

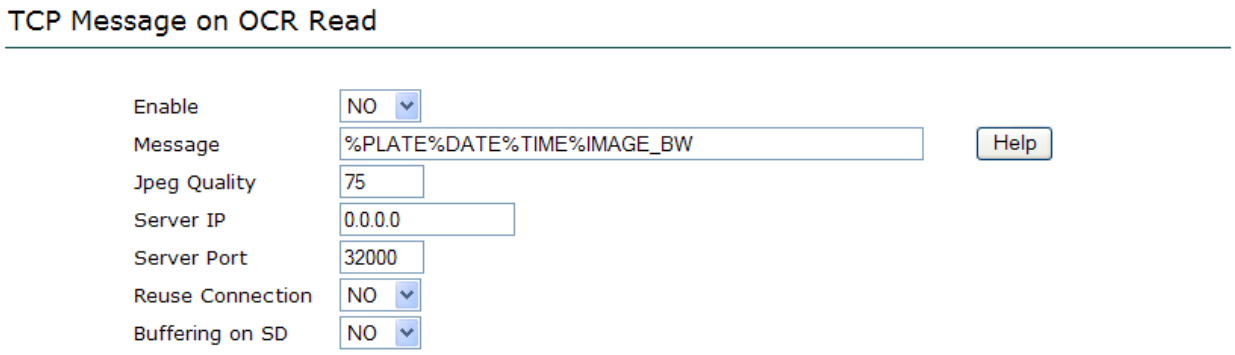
Note: The ID in the ACK message must be the same as the ID of the received message.

Sending Messages to TCP-IP Socket

This action corresponds to **TCP Msg column**. This action allows sending data to a TCP-IP socket.

Tags are used to define the data to insert in the packet to send. Such tags are entered in the Message field of the web configuration form.

It is possible to insert in the packet either data (such as car plate number, date and time) or the JPEG image of the vehicle: %IMAGE_BW for the B/W image used for car plate reading and %IMAGE_COL for the color image available with systems having an embedded context camera or systems associated with a Vega Network Context camera.



Enable: It allows to senda data over socket TCP-IP. YES means function enabled.

Message: It allows to specify which data to send over the socket TCP-IP. The HELP button specify which TAGs use. It is posssible to send also the images.

Jpeg Quality: Specify the image quality to send in the data buffer over socket TCP-IP

Server IP: IP address of the destination server.

Server Port: Server port.

Reuse Connection:
Two modes are available for handling the TCP-IP connection:

- Open and close connection at each message sending
- Open connection upon sending the first message and keep the connection active.

Regardless of mode configuration, Vega will close and open a new TCP connection if problems occurred while sending data. This means the receiver must be steadily ready to accept new TCP connections.
When in keep connection open mode, the connection is automatically shut if unused for 15 minutes.
Buffering on SD: as for precedent actions the TCP messages can be saved in the internal SD memory when network is down.

All data specified in the message field are sent on the network using a header created in such a way the server can immediately retrieve the overall number of data contained in the message to be received.

Data format always complies with the structure shown below:

Client-Server Generic Message		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	
4	Not used	
4	Not used	
4	Error	
4	Data Dimension	MSG_SIZE
MSG_SIZE	Message to send	

This data structure is called CommandHeader, "Message To send" excluded.

CommandHeader: Field Descriptions	
Header Dimension	Size in bytes of the header. It is always set to 24.
MessageCode	Identification code of the sent message
NotUsed	Not Used
NotUsed	Not Used
Error	If sending was faultless, Vega sets this field to 0. Otherwise, this field shows the error code, if any.
DataDimension	Size in bytes, 32-bit aligned, of the data to be sent after the header (header size is not included).

This protocol can handle messages of any length. The only restraint imposed is 32-bit alignment.

Sent and received data that follow the CommandHeader header must comply with a specific formatting. Each datum is identified by a code and is followed by a field with the size of the data that are about to be sent.

Message Generic Datum		
Nr of bytes	**Description**	**Value**
4	DataCode	
4	DataSize	DATA_SIZE
DATA_SIZE	DataBuffer	

This data structure is called DataHeader, DataBuffer excluded. The message may contain any number of DataHeaders. Inside the messages sent by Vega, DataHeaders are arranged in the same way according to firmware version. This may as well change when using a different firmware version. For this reason, when searching for Dataheaders in the packets received, the server will scan all DataHeaders regardless of their position inside the received message. This programming method allows for software compatibility with future Vega firmware versions.

Messages sent by Vega have the following structure:

Data Message *VEGA-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	**40000**
4	NotUsed	0
4	NotUsed	0
4	Error	0
4	DataDimension	DM
DM	Data specified via web interface	

The data having DM bytes size and attached to the sent message are those data defined in the Message field of the web interface.

Next paragraph describes available data codes in DM data buffer.

In Vega web interface it is possible to select the data to attach to the message sent from Vega to the server. To define the data to be attached, TAGS are used. For example, use %PLATE in order to attach the string with the car plate number.
The table below gives an overview of available TAGS on the web interface, their description and identification code included in the message.

TAG WEB	Description	Data Code	Data Size	Datum Type
%DATE	Date of transit in string format. Format is YYYY-MM-DD. Example "2008-01-16"	14000	12	STRING
%TIME	Time of transit in zero-terminate string format. Format is HH-MM-SS-mmm (where mmm = milliseconds). Example "10-50-11-234"	14001	16	STRING
%NETBIOSNAME	Netbiosname in terminate string format: Example: "VEGA_GATE_1"	14002	32	STRING
%PLATE	Read car plate number string, followed by "-" character and by three letters of the country of origin. Example: "AA182NN-ITA"	14003	24	STRING
%PLATE_STRING	Read car plate number string without country of origin. Example: "AA182NN".	14004	20	STRING
%PLATE_COUNTRY	STRING of the characters for Country of origin. Example: "ITA"	14005	4	STRING
%NREAD	Number of times the car plate number was read during transit.	14006	4	LONG
%IMAGENAME	STRING containing the file name of the image saved to FTP.	14007	128	STRING
%IMAGEPATH	STRING containing the path used for saving to FTP.	14008	128	STRING
%TRANSIT_ID	Counter of Number of transits, starting from camera activation.	14009	4	LONG

%PLATE_MIN_X	X-coordinate of the upper left corner of the car plate rectangle	14010	4	LONG
%PLATE_MIN_Y	Y-coordinate of the upper left corner of the car plate rectangle	14011	4	LONG
%PLATE_MAX_X	X-coordinate of the lower right corner of the car plate rectangle	14012	4	LONG
%PLATE_MAX_Y	Y-coordinate of the lower right corner of the car plate rectangle	14013	4	LONG
%SPEED	Vehicle speed in Km/hx100 (Loop Detector Systems only) Example: 12412 corresponds to 124.12Km/h	14014	4	LONG
%CLASS	Vehicle Class, in numeric format (Loop Detector Systems only)	14015	4	LONG
%CLASS_STRING	Vehicle Class in STRING format (Loop Detector Systems only) The possible values are: "CAR", "CAR WITH TRAILER", "LORRY", "LORRY WITH TRAILER", "BUS", "MOTORCYCLE-MOTORBYKE", "UNKNOWN", "MOTORCYCLE", "MOTORBYKE", "CAR"	14016	32	STRING
%SN	Serial Number of Main Board	14017	4	LONG
%DIRECTION	STRING referring to vehicle line of march. The possible values are: "GOAWAY" "APPROACH" "UNKNOW"	14018	12	STRING
%NET_TRIG_ID	STRING received using trigger via network (available in TRIGGER_ETHERNET mode only)	14019	32	STRING
%IMAGE_BW	B/W camera image, in JPEG format	14020	IMG_BW_DIM	BUFFER
%IMAGE_COL	Color-camera image, in JPEG format	14021	IMG_COL_DIM	BUFFER
% OCRSCORE	Score of OCR regarding the plate reading	14022	4	LONG

All sent strings are null-terminated.

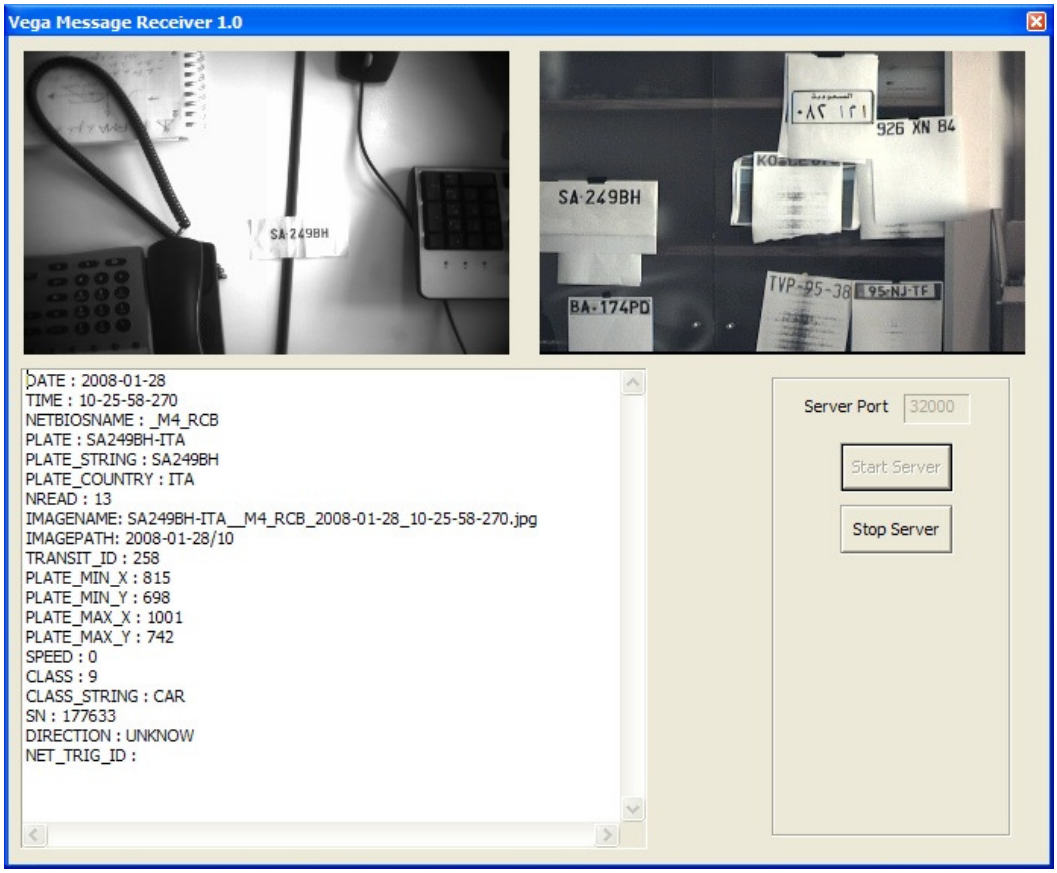
The values of DATA_DIM for STRING data are always multiples of 4 bytes. Unused bytes are always set to zero. For example, the %PLATE TAG produces the "AA182NN-ITA" STRING that is 11 bytes long; since DATA_DIM of this TAG is 16, the last 5 bytes are set to 0.

In column "Datum Type" LONG refers to a 32-bit integer.

The values of DATA_DIM for BUFFER data are not necessarily multiples of 4 bytes, yet the occupied buffer space is always a multiple of 4 bytes, this in order to keep structure alignment. For example: let's consider IMG_BW_DIM and suppose this is a 34231 bytes image. This means that DATA_DIM=34231. But data buffer sent from Vega is larger (so as to keep 4 bytes-alignment) and the result is a 34232 bytes image.
When using the DATA_DIM value to skip to next datum of the message, this should not be overlooked.

A server in Windows Visual C++ 6.0 was developed that makes application testing and developing easier. Such server allows opening a single TCP listen connection to display data and images received form a Vega system. In the example that follows, no additional connection is allowed while a Vega client is connected.

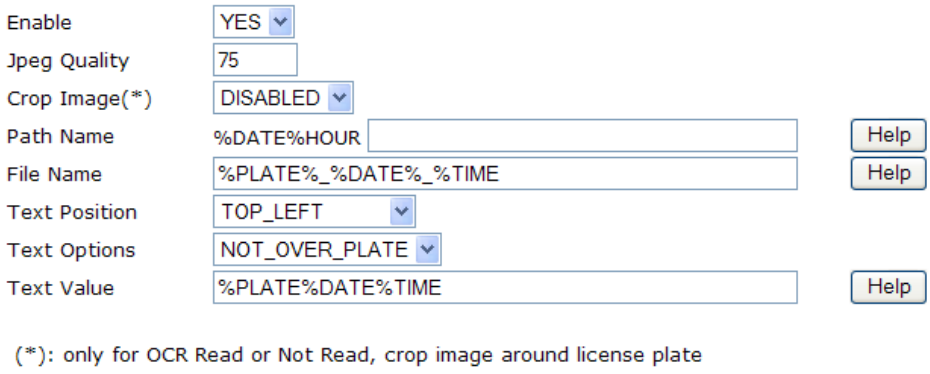
In order to receive a new connection from Vega, the server should always have an open listen connection. This operational mode is compulsory in case of errors in Vega client as they may cause the connection to close and automatically to reopen.
In our example, the server uses port 32000.
Tattile provides for the source code of this project. The source code uses Windows sockets with no additional DLLs.
The image below shows the program dialogue window. The two windows display the black and white image and the color image, if available (with Vega Plus dual-camera systems only). The right window shows all data in the received message.



Data storage over Secure Digital memory

Only for cameras equipped with internal SD memory. It allows to save data over a partition od SD memory regardless of network status. In this case the saving is NOT managed with circualr buffer.

SD Saving on OCR Read



Enable: It allows to store data over SD memory. YES means function enabled.

Jpeg Quality: Specify the image quality to save in the SD memory.

Crop Image: It allows to cut the image around the position of the plate displayed.
Available dimension of the cut are: 320x240, 640x480, 800x600, 1024x768 pixels.

Path Name: It allows to specify the path over the SD where to save data.
The first part of the path is mandatory Date\Hour.

File Name: It allows to specify the name of the image saved on the SD.

Text Position: It allows specifying the position of a text window inside the saved image. This window contains the information entered in Text Value. The allowed values are: TOP_LEFT, TOP_RIGHT, BOTTOM_LEFT, BOTTOM_RIGHT and DISABLED.

Text Options: It allows to enable the option NOT_OVER_PLATE. This option move automatically the text window when positioned over the plate, in order to not cover the plate.

Text Value: It allows specifying information to be included in the image, whose position is indicated in Text Position.
It is necessary to use appropriate tags to provide this information.

Digital Signature on JPEG Images

As of firmware version 4.71 included, all JPEG images generated by VEGA systems are signed – both the images saved to FTP and the images sent to TCP-IP socket.
The signature process is meant to embed a digital signature into JPEG images generated by Tattile machines. Digital signatures allow:

- Verifying that an image comes from a Tattile system.
- Verifying whether an image has been edited - if so, the authentication process will fail.

A third party cannot produce correctly signed images even if it knows the procedure for authenticity verification.

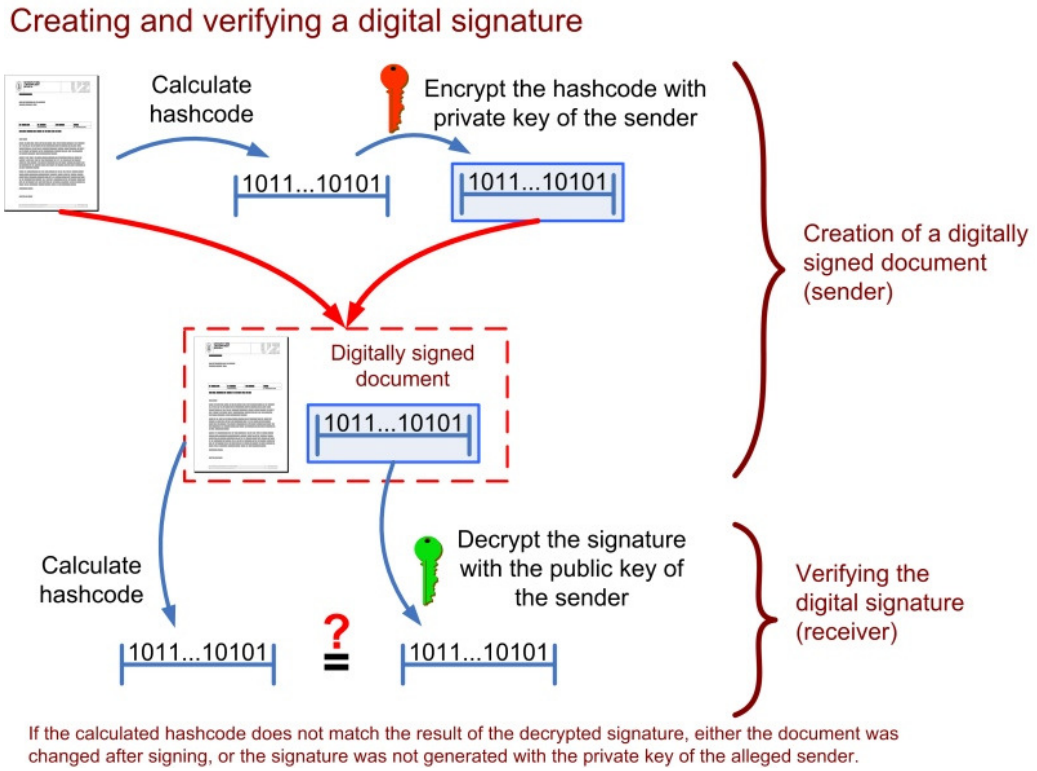
The digital signature is inserted inside the JPEG image header. The digital signature is built using whole JPEG image processing, header included.

The signature algorithm uses an asymmetric key ciphering. The ciphering key is private, secret and embedded in VEGA systems.
To check the authenticity of the signature, a public key is used.

Standard FIPS-186-2

In order to create a digital signature, several hash and encryption/decryption algorithms are available. FIPS 186-2 algorithm was used here. For complete specs, please see the "fips186-2-change1.pdf" file - downloadable at http://csrc.nist.gov/publications/PubsFIPS.html.
FIPS is the acronym for Federal Information Processing Standard
http://csrc.nist.gov/publications/fips/index.html.

In this standard, the SHA-1 hash algorithm is used while the encryption algorithm is the DSA (Digital Sign Algorithm). Please see http://en.wikipedia.org/wiki/Digital_Signature_Algorithm for further details on DSA.



Digital Signature on Tattile JPEG Images

Digital signature is inserted into JPEG image headers as a string. When opening the JPEG image in a text editor, it is possible to view the signature string (see red line in the window below).

```
S_NETBIOSNAME=_VEGA_8MEGA
I_SN=101777
I_BOARD_FPGA_VER=21
I_BOARD_CODE=243
I_BOARD_REV=3
S_DATE=2008-03-18
S_TIME=09-51-29-471
S_PLATE=SA249BH-ITA
I_NREAD=27
I_JPEG_QUALITY=95
I_GAIN=200
I_SHUTTER=4000
I_STROBO=200
I_SPEED=NA
S_CLASS_STRING=CAR
I_QUALIF_0=NA
I_QUALIF_1=NA
I_OCCUPANCY_TIME=NA
I_GAP_TIME=NA
S_DIRECTION=UNKNOW
S_OCR_CFG=Win:(0,0) (1023,767) Ch:8x15 25x40 Sens:4 SelMode:BEST_LUMINANCE
NumJolly:0 MaxTime:2000
I_PLATE_MIN_X=752
I_PLATE_MIN_Y=433
I_PLATE_MAX_X=877
I_PLATE_MAX_Y=459
S_NET_TRIG_ID=
S_IMAGE_SIGN=302D02141EC0A396910402B4730AEDEB9E0409981BAB0A81021500A9013C58C836
145EF6CFD08126AFF4C99306FDA3
```

SHA-1 produces a 160-bits digest message that goes through the DSA algorithm and produces a signature between 46 and 48 bytes long. Such variability is brought about by a random component entered by the signature algorithm.
Assuming the same image and private signature key are being used, the produced signature always differs by this random component introduced by the DSA algorithm.
The buffer produced by the DSA algorithm is then translated into an HEX string and inserted in the JPEG image header, after the red-highlighted S_IMAGE_SIGN TAG, in the window shown above.
The translation of the signature into an HEX string allows using printable alphanumeric characters instead of a binary data buffer.

The public key of verification is made available to whoever wants to verify the signature authenticity.

SHA-1 hash procedure used for digital signature generation includes the image entire JPEG header, so that any tampering with the JPEG header or image will automatically determine the signature authentication process failure.
The JPEG image header contains the serial number of the card used to generate the image (TAG I_SN at the header top). This means the system stems from the hardware whose serial number is shown in I_SN.

Image signature procedure with VEGA systems is as follows:

- All space characters – where the signature strings is to be entered – are inserted in the JPEG image header.
- On the entire image, PEG header included, the digest is calculated.
- The signature is calculated over the digest.
- The signature is entered in the JPEG header.

Digital Signature Verification

To ease the verification of digital signatures, Tattile provides a DSA_VERIFY.dll to use for signature verification in JPEG images.
The private verification key is embedded in the DLL.
The DSA_VERIFY_CONSOLLE.exe describes how this DLL can be used for digital signature verification purposes.

Statistics and Diagnostics

Using the WEB pages

Sys Statistics

This page contains the statistics about data sending from Vega to external devices. The info in this page is very useful upon installation as they help check the available pass bands from Vega to the data receiving servers.

In addition to this info, the page displays the statistics about synchronization with the SNTP server. These statistics are updated when synchronization with time server is enabled (Network Settings page).

System Statistics

	Time[sec]		Bandwidth[KB/sec]		Counters	
	Mean	Max	Mean	Min	Success	Failed
FTP Save Image	0.16	0.28	1140	598	26	2
FTP Save DB	0.14	3.07	0	0	129	2
TCP Send Message	0.00	0.00	0	0	0	0
PNS Alarm	0.00	0.00	0	0	0	0

Time Server Sync.	Time Difference Min	: -1.0 ms
	Time Difference Max	: 3.0 ms
	Time Difference Mean	: 0.9 ms
	Time Difference StdDev	: 0.0 ms
	Syncro Error Counter	: 0

Using the VRC server

While operating, Vega firmware keeps track of the errors detected as of startup. This allows keeping under control any anomalies, such as problems with the FTP server that could prevent from image downloading.
The following command allows reading the status of the error counters:

Read Error Counters *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35006
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Read Error Counters *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35006
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	84
4	DataCode	13200
4	DataSize	4
4	DataBuffer	Number of errors in image transfer from Vega to FTP server
4	DataCode	13201
4	DataSize	4
4	DataBuffer	Number of errors in image transfer from Vega to data Base in FTP server
4	DataCode	13202
4	DataSize	4
4	DataBuffer	Number of errors in alarm sending from Vega to PNS
4	DataCode	13203
4	DataSize	4
4	DataBuffer	Number of errors in log sending from Vega to FTP server
4	DataCode	13204
4	DataSize	4
4	DataBuffer	Number of errors in image grabbing from Vega board
4	DataCode	13205
4	DataSize	4
4	DataBuffer	Number of errors in synchronizing between Vega and time server
4	Data Code	13212
4	Data Size	4
4	Data Buffer	Number of erros in TCP message Vega to external receiver

The following command allows resetting the error counters:

Reset Error Counters *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35007
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Reset Error Counters *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35007
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

System Enabling and Disabling

Using the WEB pages

General Settings

Enable Engine YES

Acquisition Mode FREE_RUN

Site Address

TCP message after FTP Actions NO

Reset Apply

Enable Engine

This parameter takes two possible values: **YES** or **NO**. It allows enabling/disabling the processing of the images grabbed by VEGA.
If set to **NO,** the device is on sort of stand-by and its infrared illuminator is disabled, which means that any commands from external triggers are ignored.
The infrared illuminator is momentarily enabled only if the OCR Camera page is being accessed.

Using the VRC server

This command enables the system. It is the same as the EnableEngine commands found in Vega web server General Settings page. If car plate reading process is already enabled, this command executes no action and no error is given in the message sent back by the VRC server (error code: 0).

Enable system *CLIENT→SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35004
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Disable system *SERVER→CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35004
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

This command disables the system. It is the same as the EnableEngine commands found in Vega web server General Settings page. If car plate reading process is already disabled, this command executes no action and no error is given in the message sent back by the VRC server (error code: 0).

Enable system *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35005
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Disable system *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35005
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Operating Modes

Prior to describing the different operating modes, let's elaborate briefly on the concept of TRANSIT itself. By transit we mean that any of the three OCR_READ, OCR_NOT_READ and OCR_NO_PLATE events is being generated. For a detailed description of each event, please see their description in Events/Actions page.

A transit event is given by the processing of multiple images of the same vehicle. To execute the actions described in the Events/Actions page (Save Image to FTP, Send to PNS etc.), a single image will be used.
Such image is selected based on the criterion defined in the Temporal Integration section in PlateReader page.
VEGA systems can operate in two different modes:

- FREE RUN mode
- TRIGGER mode

When in FREE RUN mode, VEGA freely grabs and processes images. The software automatically detects the presence of a car plate in the image and thus generates an event. In FREE RUN mode, the system may generate the following events:

- OCR READ
- OCR NOT READ

Since image acquisition is seamless, the infrared illuminator is steady active.

Several TRIGGER modes are available, but the basic principle they work on is similar:

- The VEGA system receives a start trigger.
- Following the start trigger, image grabbing and processing begins.
- The VEGA system receives a stop trigger and the internal system generated an event.

In TRIGGER mode, the system may generate the following events:

- OCR READ
- OCR NOT READ
- OCR NO PLATE

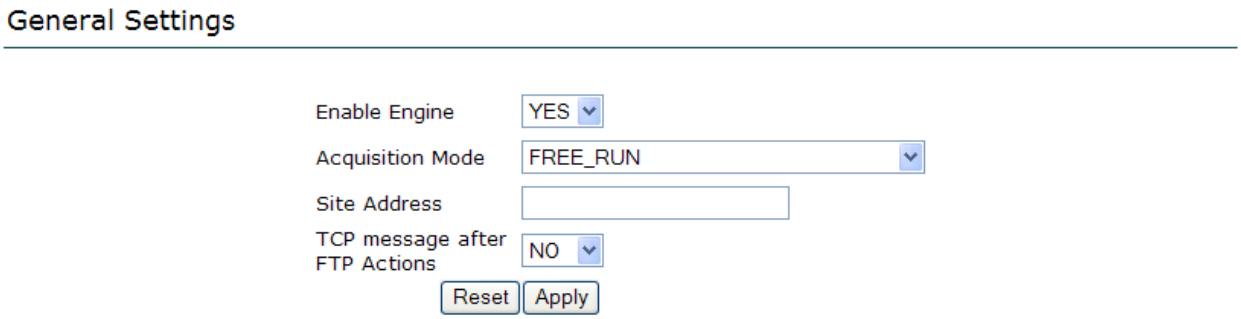
Since image grabbing takes place between the start and stop triggers only, the infrared illuminator is active during this time interval.

The NO PLATE event can occur only while in TRIGGER mode since in FREE RUN mode, the event is generated based on whether a car plate is detected inside the image. In FREE RUN mode, vehicle not having a car plate generate no event therefore, it is necessary to use either one of the TRIGGER modes in order to grab images of any vehicle no carrying a car plate.
The time interval between a start and a stop trigger is called Gate Time.

Using the WEB pages

General

In the General page it is possible to set the operating modes.



Acquisition Mode
It allows selecting the system operating mode. The following values are selectable:

- FREE_RUN
- TRIGGER_START_STOP
- TRIGGER_START_TIME
- TRIGGER_START_FREE_RUN_STOP
- TRIGGER_ETHERNET
- TRIGGER_ *loop_system_initials*

Note: TRIGGER_*loop_system_initials* is only available for VEGA Plus machines (the loop management peripheral is integrated inside the plate reader housing).

Warning: Changing the Acquisition Mode parameters causes the machine to reset. During reset, the machine loads the new operational parameters and stops operating for about 10 seconds while making changes effective.

Site Address
This field can contain an alphanumeric string, such as the address of a system location. This string is available as %SITE_ADDRESS TAG and can be sued in the Text Value field of the Save Image action.

TCP message after FTP Actions
With this parameter you can enable (YES) TCP send message after every FTP actions enabled (FTP save image and FTP save DB)

Free Run Mode

When in **FREE_RUN** mode, the unit freely grabs images and non-stop OCR processes them. The software automatically detects a vehicle transit and generates a transit event for each vehicle.

Trigger from Digital Inputs Mode

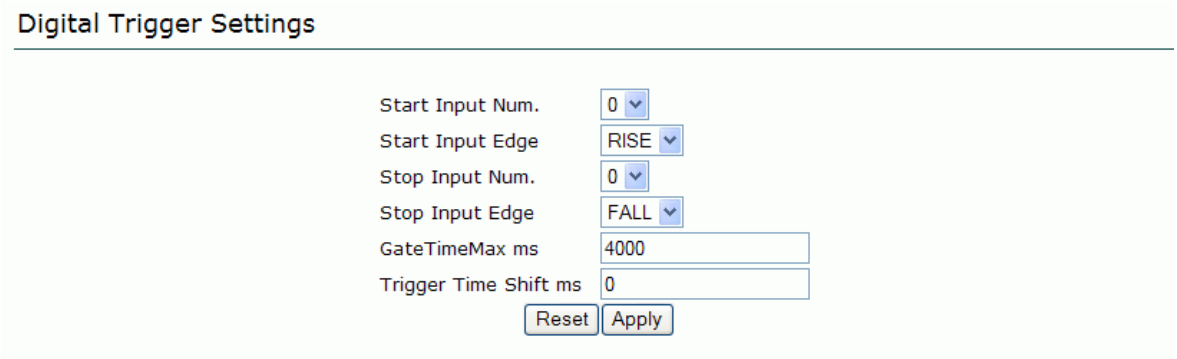
There are three trigger from digital inputs modes:

- TRIGGER START STOP
- TRIGGER START TIME
- TRIGGER START FREE RUN STOP

The digital inputs are defined via the Digital Trigger web page.

Digital Trigger

When the machine is in Free Run mode, parameters set in the Digital Trigger page are ignored. The Digital Trigger page contains the following fields:



Start Input Num.:
It allows setting the number of the digital input associated with the system start trigger.

Start Input Edge:
It allows setting the trigger state (rise edge or fall edge), which represents the Start condition for image grabbing by VEGA.
Stop Input Num.:
It allows setting the number of the digital input associated with the system stop trigger.

Stop Input Edge:
It allows setting the trigger state (rise edge or fall edge), which represents the Stop condition for image grabbing by VEGA

It is possible to use the same digital input as start trigger and stop trigger, provided that rise and fall edges have different values.

Gate Time Max ms:
It allows setting the value, in milliseconds, of the maximum period between start and stop of the trigger. The Gate Time Max value is not relevant when the machine is in Free Run mode (free grabbing). Its values may range from 40 to 30.000 (equivalent to 30 seconds).

Trigger Time Shift ms
It allows setting a delay to be applied to the START and STOP TRIGGER events. This may be useful in order to insert a delay between trigger detection and processing initialization

When in **TRIGGER_START_STOP** mode, the unit grabs and processes the images in the time period between the start trigger and the stop trigger. Typically, this mode is associated with 2 external sensors that are connected to the VEGA system (e.g. photocells, magnetic loops etc.), which determine the grabbing start and stop mode, respectively. For details on how to setup the digital I/Os as trigger sources, please refer to section Digital Trigger in this Guide. In case the stop trigger is not being activated within the "Gate TimeMax. ms" interval (see Digital Trigger page), the system firmware automatically generates the stop trigger when such interval expires. Any stop trigger received prior to a start trigger will be ignored. Any start trigger received after a start trigger makes the firmware automatically generate a virtual-stop trigger and initialize a new transit event.

When in **TRIGGER_START_TIME** mode, the unit starts image grabbing when the start trigger is activated and stops image grabbing after a time interval that was previously defined in DIGITAL TRIGGER page, in Gate Time Max. ms (the value is in milliseconds). Once GateTime has expired, a transit event is generated. If the system receives a start trigger during GateTime period, it immediately generates a transit event and starts again image processing of the new transit.

When in **TRIGGER_START_FREE_RUN_STOP** mode, the unit starts image grabbing when the start TRIGGER is activated and then starts grabbing and reading car plates in FREE RUN mode. The system may generate multiple transit events during the interval between start trigger and stop trigger

Trigger Ethernet Mode

When in **TRIGGER_ETHERNET** mode, the unit starts grabbing images upon receiving the start TRIGGER message from the Ethernet network. The start trigger message contains a precise time in milliseconds that expresses the GateTime during which the machine is to grab images. When GateTime expires or upon receiving a stop trigger message, the machine stops image grabbing. The trigger message also contains a generic string the system uses to generate trigger messages where info may be inserted. Such string will later made available on the web interface using the %NET_TRIG_ID tag. This makes it possible to associate to any transit data and images other info about the specific trigger message from which they were originated.

Using the VRC server

It is possible to use this message only when Vega is set to "TRIGGER_ETHERNET" mode (please refer to Web Interface Software Programming Guide, General Settings).

If this message is sent while the camera is operating in a different mode, the VRC server response will be an error message. The sent message must always contain the TriggerIdString string. Such string requires no specific formatting and can be used as trigger univocal identifier: for example, it may be made up using the current date and time of the VRC client. It is possible to use the TriggerIdString as TAG when programming Vega actions (please refer to the Web programming Guide).

Trigger Start *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35008
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	52
4	DataCode	13207
4	DataSize	4
4	DataBuffer	Gate Time in milliseconds
4	DataCode	13206
4	DataSize	Length of TriggerID string.
32	DataBuffer	TriggerId string

Trigger Stop *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35008
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Upon receiving this message, Vega starts image grabbing and processing, for a time period that corresponds to the gate time. When gate time expires, a transit event is generated. In case a "Stop Trigger" message is received before gate time expires, the gate time is ignored and the transit is closed upon receipt of "Stop Trigger".
If live video from browser is under way, the trigger signal is ignored and VRC response is an error message.

If stop trigger message is sent, image grabbing is terminated and a transit event is generated.
This message must contain the same TriggerIdString as the one in the start message.

Trigger Stop *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35009
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	40
4	DataCode	13206
4	DataSize	4
32	DataBuffer	TriggerIdString

Trigger Stop *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35009
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

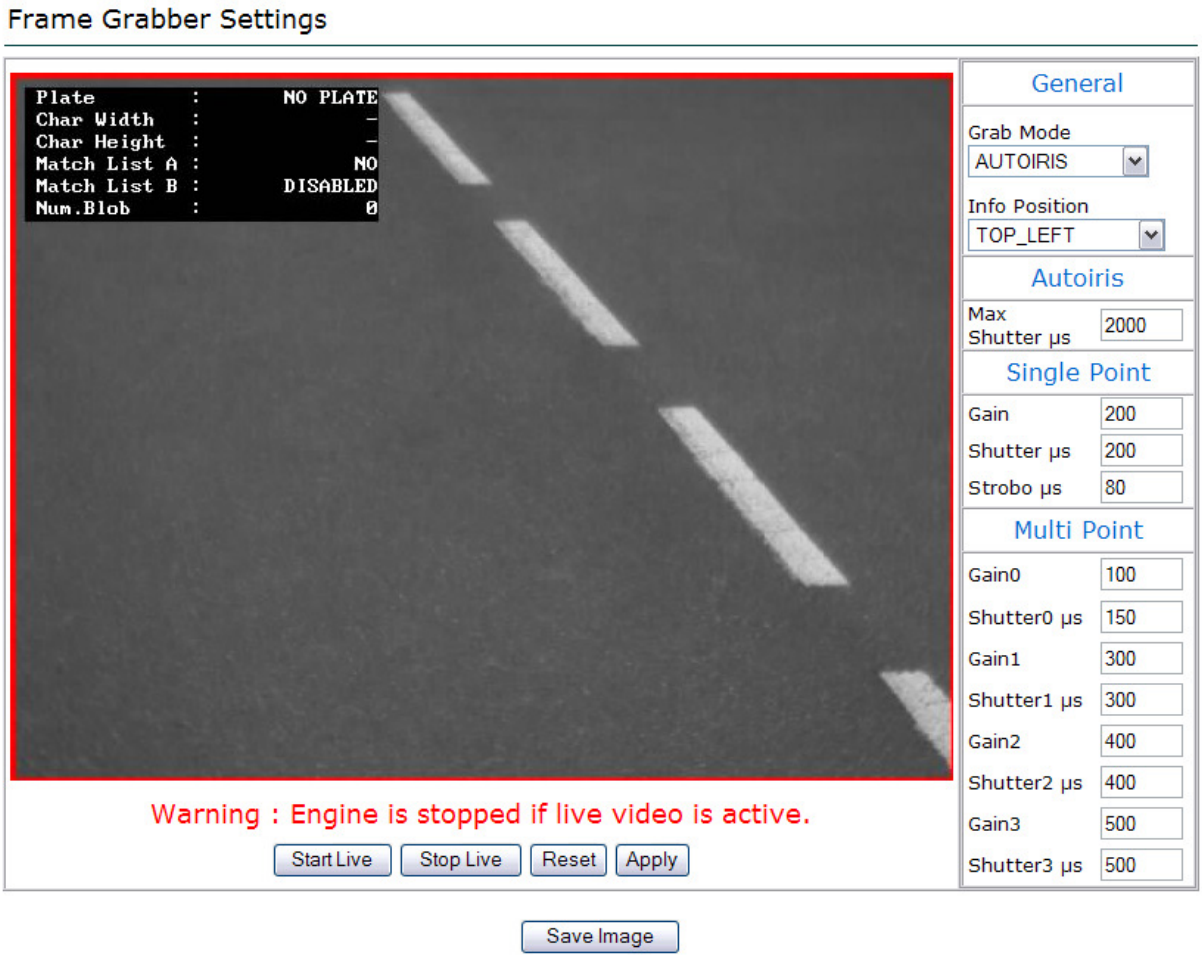
If live video from browser is under way, the trigger signal is ignored and VRC response is an error message.

Trigger from Loop System Mode

This mode is available with VEGA Plus with embedded loop system card only.

When in **TRIGGER*_loop_system_initials*** mode, the VEGA Plus machine starts image grabbing when the signal from the loop system starts. When the OCR reading session ends, upon exit the unit provides the plate number reading results even with no stop trigger. VEGA Plus gets from the loop system information about the car transit, such as punctual speed and vehicle class. These data can be used when programming (using the web interface) the event action matrix. The only possible use of the loop system is the activation of the **TRIGGER*_loop_system_initials*** mode. When using any other mode, the loop system will not be used, even if installed.

Image Grabbing



The left side area of this page displays "live" video images generated by the VEGA machine (see Figure below).
The red rectangle on the image border represents the search plate window. It is possible to set size and position of this window in PlateReader page, section PlateLocator.

The right side area contains the following fields:

General

Grab Mode: In this section, it is possible to set the image-grabbing mode: **SINGLE_POINT**, **THREE_POINT or AUTOIRIS.**

Result Position: In this section, it is possible to specify, inside the live image, the position of the OCR reading results and the unit's work parameters**.**
The allowed values are: TOP_LEFT, TOP_RIGHT, BOTTOM_LEFT_BOTTOM_RIGHT and DISABLED.

Single Point

In this section it is possible to set the parameters to use in **SINGLE_POINT** grabbing mode.

In this section, it is possible to set the parameters to use in the **MULTI_POINT** grabbing mode.

- **Gain:** It indicates the gain of the video signal.
- **Shutter us:** It indicates the exposure time in microseconds.
- **Strobe us:** Activation time of the infrared illuminator.

This mode is used for system testing purposes and should not be used for standard operating.

Multi Point

In this section, it is possible to set the parameters to use in **THREE_POINT** grabbing mode
Image-grabbing cyclically uses the following
Gain0-Shutter0
Gain1-Shutter1
Gain2-Shutter2
Gain3-Shutter3

This mode is recommended for all installations with firmware version lower than 4.79.
The **Save Image** button allows saving an image for each work point. It is very useful for evaluating the system work points.
The first work point Gain0-Shutter0 and the last one Gain3-Shutter3 are dynamically included and excluded using a software command that works based on current light variances. This allows for system optimization because info less images (i.e. images either too dark or saturated) will not be processed.
Set values must be steady crescent which means that the Gain3>Gain2>Gain1>Gain0 and Shutter3> Shutter 2> Shutter 1> Shutter 0 criterion must be always met. The commands in the web page do not allow entering values that do not comply with such requirement.

Autoiris

Automatic grabbing mode. **As of firmware version 4.79 included, it is possible to use this operating mode not only for setup but for regular system operating as well.** The reason for this is that as of this version, a new algorithm has been added that controls exposure and gain, integrated with the infrared illuminator control. The only parameter setting required is the maximum exposure time, whose value should be set based on the maximum vehicle speed. Too long an exposure time would produce blurred images and result in lower reading performance.

Maximum exposure time value should therefore set to a low enough value so as not to get blurred images.
During low light hours, the higher the exposure time the higher chances are to get images where the vehicle is visible.
Using autoiris, images show better lighting uniformity during the whole day, while using the Four-Points mode image lighting vary more.
It is advisable using the autoiris mode while using the Four-Points mode whenever autoiris can't provide for satisfying performance.

In the page bottom, the following function buttons are available:

Start Live: It allows starting live video.
Stop Live: It allows stopping live video.
Reset: Press this button to cancel values that have been already typed in but not confirmed yet using the Apply button.
Apply: Use this button to implement the changes entered in this page.

The "Save Image" button allows saving (Jpeg format) the image currently displayed. The image is saved with the natural resolution of the image sensor.

Warning: Engine is stopped if live video images are displayed in the OCR Camera page and this means no event is available. Processing is automatically reactivated upon exit from the OCR Camera page.

Using the VRC Server

This command allows grabbing a JPEG image. Image size must be specified in the data message sent to the VRC server. Image size must be smaller than or equal to the camera CCD sensor resolution. The message must also contain JPEG quality. Some Vega models come with two video cameras, a B/W camera and a color camera. It is possible to select the video camera for image grabbing. To do so, enter the camera ID in the Sender field of CommandHeader. Vega camera, the one specified in this message, will grab images in an electronic auto-shutter mode. This means that the first frames may be bright or dark while the auto-shutter system adjusts.

Grab JPG Image *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	25166
4	Receiver	0xFFFFFFFF
4	Sender	Camera ID 0 Indicates the B/W Camera 1 Indicates the Color Camera
4	Error	0
4	DataDimension	28
4	DataCode	10015
4	DataSize	4
4	DataBuffer	JPEG quality [1,100]
4	DataCode	10069
4	DataSize	8
8	DataBuffer	4 byte Image Width in pixel 4 byte Image Height in pixel

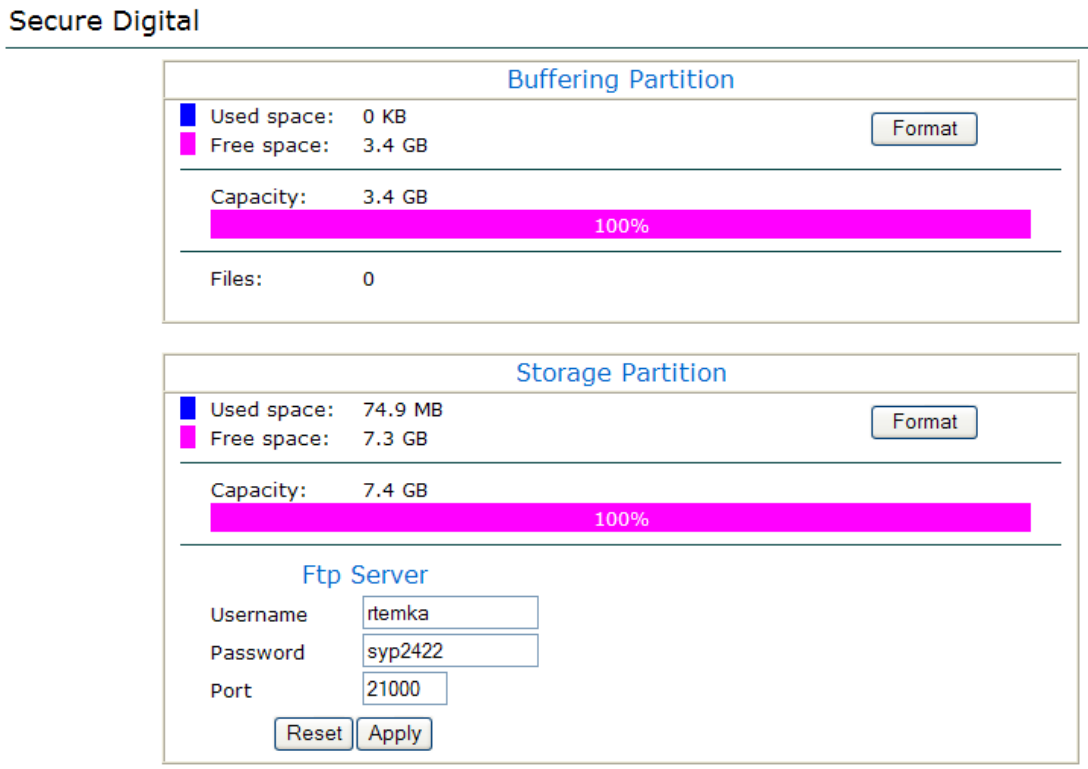
Grab JPG Image *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	25166
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	68 + IMAGE_SIZE
4	DataCode	2001
4	DataSize	12
12	DataBuffer	Date and Time of image grabbing 1byte: day 1byte: month 2bytes:year 2bytes:hour 2bytes:minutes 2bytes:seconds 2bytes:milliseconds
4	DataCode	2000
4	DataSize	40 + IMAGE_SIZE
40 + IMAGE_SIZE	DataBuffer	Image Header 4 byte: NOT USED 4 byte: NOT USED 4 byte: Image header size = 40 4 byte: IMAGE_SIZE JPEG Image Size 4 byte: Image Width in pixels 4 byte: Image Height in pixels 4 byte: NOT USED 4 byte: NOT USED 4 byte: NOT USED 4 byte: NOT USED IMAGE_SIZE byte: JPEG image data buffer

Using this message causes the Vega plate reading process to halt. Plate reading will automatically resume once the VRC server will have sent the requested image.

Secur Digital Memory

Some VEGA family models come with optional SecurDigital (SD) memory. Please refer to the product Installation Guide to check for which models this support is available.

SD memory management is entirely automatic and transparent by the VEGA firmware.



SD memory is used to store data of VEGA generated events. The storage occurs only if the action planned for the event can't be executed.

Let's consider for example the 'save image to FTP server' action taken upon car plate reading event. In case the FTP server is not available (service not available or whatever network connection problem) then the image is being stored to SD memory.

As soon as the FTP server is back to service, the image is automatically read by the SD and sent to the server. This action is in parallel to the operating of the system as a whole.

Before sending the image, the event/action matrix is checked. If the action is enabled, the image will be sent while if disabled, the image will be deleted. In general, whenever action-related data are retrieved from the SD memory, the relevant action parameters that were set via web page are always checked first so that the action is executed according to these setting.

Let's assume for example that when saving the image to SD, the FTP server IP is 192.168.0.100. If upon reading the image from SD the server IP is 192.168.0.200, then the image will be sent to this IP address.

Using the VRC server

This message allows formatting the Secur Digital (SD) memory. The SD memory is available with certain VEGA PLUS machine models. When the server sends a response to the client, SD formatting has been completed. The formatting procedure takes about 300ms, which is the time it takes for the server to send the response command.

Format Secur Digital *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35016
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Format Secur Digital *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35016
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

This message allows requesting info about the current status of the Secur Digital (SD) memory.

- Memory total size in Kbytes.
- Memory used space in Kbytes.
- Number of stored events.

Request Info Secur Digital *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35017
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Request Info Secur Digital *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35017
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	36
4	DataCode	13213
4	DataSize	4
4	DataBuffer	Memory total size in KBytes

4	DataCode	13214
4	DataSize	4
4	DataBuffer	Used memory size in KBytes
4	DataCode	13215
4	DataSize	4
4	DataBuffer	Number of stored events

In case of any error in the data packet from the server, DataDimension value is 0 and no data is found except for the response header.

OCR Configuration

The VEGA system is capable of real time OCR processing grabbed images. Up to 4 countries car plates can be simultaneously read.
It is necessary to update the VEGA software if the user wants to change the countries the VEGA system is to read.
To view the countries the VEGA system is capable of reading, please access the web server and click the DeviceInfo icon: go to the line that shows the firmware version, as in the example below:

Example 1:
```
Firmware version        = VEGA LPR 4.97 ITA
```

Example 2:
```
Firmware version        = VEGA LPR 4.96 NDL-GER-BEL
```

Configuring the OCR Parameters


Plate Reader

The Plate Reader page contains the following fields:

Plate Reader Settings

Plate Locator		Char Size Pixel		Plate Format	
Win MinX Pixel	0	Min Width	8	Max Jolly Chars	0
Win MinY Pixel	0	Max Width	30		
Win MaxX Pixel	1023	Min Height	15	Plate With Separator	NO
Win MaxY Pixel	767	Max Height	50		
Sensitivity					

Temporal Integration	
Max Time Transit ms(*)	2000
Min Time Same Plate ms(*)	10000
Image Selection Mode	NOT_USED
Enable Multi Out Same Plate(*)	0
(*): Used in Free Run Mode Only	

Reset Apply

Plate Locator

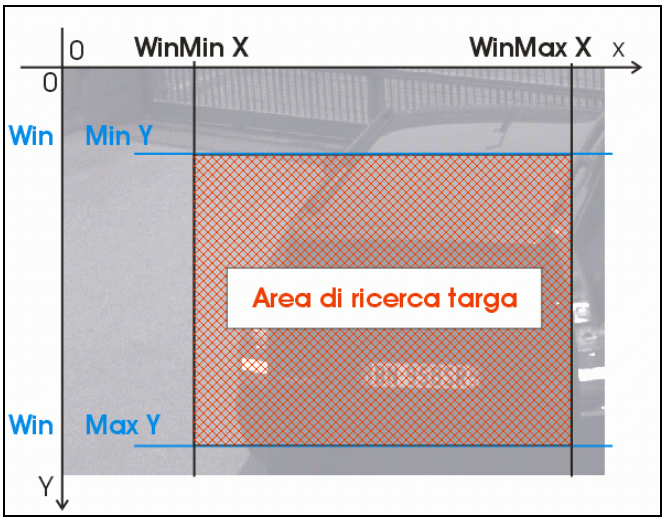
This section contains the coordinates of the car plate search area in the image. Such search window is displayed with a red border on the live image in the Ocr Camera page.
By setting this search window, the User is allowed to exclude image zones where, supposedly, no car plate will ever be detected or to exclude image zones where plate reading needn't be executed so that overall image processing time is shorter.

Win MinX Pixel: Inside the image, it represents the X-coordinate of the left upper angle of the plate-searching zone (*see Figure*)

Win MinY Pixel: Inside the image, it represents the Y-coordinate of the left upper angle of the plate-searching zone (*see Figure*)

Win MaxX Pixel: Inside the image, it represents the X-coordinate of the lower right angle of the plate-searching zone (*see Figure*)

Win MaxY Pixel: Inside the image, it represents the Y-coordinate of the lower right angle of the plate-searching zone (*see Figure*)



Sensitivity: This value may range from 2 to 8. Typically, used values are 4, 5 and 6. The higher the "Sensitivity" the higher the sensitivity of the car plate search algorithm. It is recommended to avoid higher sensitivity values unless these are absolutely necessary: high values may cause longer calculations with an overall lower system performance.

Char Size Pixel:

These parameters represent the size of the plate characters the OCR video camera is to recognize.
.

The minimum value represents the minimal threshold for recognition. Below this threshold, OCR will NOT recognize the characters found as valid. The maximum value represents the maximal threshold for recognition. Above this threshold, OCR will NOT recognize the characters found as valid.

These maximum and minimum character sizes should be empirically set upon installation, in order to check whether the OCR recognizes the car plate characters.

Min Width: This is the plate character minimum width, in pixels.

Max Width: This is the plate character maximum width, in pixels.

Min Height: This is the plate character minimum height, in pixels.

Max Height: This is the plate character maximum height, in pixels.

Adjusting Character Size

1. In page **Ocr Camera**, take a shot of the car plate under the actual conditions later used by the VEGA unit.
2. Use the **Result Position** setting in order to activate the OCR results image overlay feature.
3. Now, when the plate reading occurs, on the image is displayed not only the car plate but **also the character size** (in pixels
4. **Enter these size values in the Plate Reader page,** using the exact **minimum and maximum values** displayed on screen during live take, from the position of the most distant vehicle (min. size) to the position of the vehicle closest to the reader (max. size).
5. If car plate reading is not reached, try and set a higher character maximum size (in page Plate Reader), until a valid reading is reached
6. In the Result web page, it is possible to read the character size of last detected vehicle. This is useful when checking the validity of the character size setup during system operation.

Character Size adjustment is important and it significantly affects overall system performance

Plate Format

Max Number: This feature allows setting the maximum number of plate characters the VEGA machine OCR is allowed not to recognize within the car plate. If set to 0 (zero), the reading is valid only if the VEGA machine recognizes every character of the number plate. If set 1 or 2 (maximum value), the VEGA machine will take as valid the reading obtained and the result will include one or two Jolly characters – represented by the # symbol – placed instead of the unrecognized characters. Car plate reading with jolly characters generates an OCR_READ event.

Plate With Separator: allows to enable (YES) inserting a character "_" between group of character found by OCR into plate string. If enabled it will be put "_" between group of char only for German plates (DEU).

Temporal Integration

The VEGA system processes multiple images for each vehicle, which allows for higher OCR reading effectiveness and reliability. Section Temporal Integration contains the parameters for managing the whole packet of processed images for each single transit event.

Max Time Transit ms: This parameter is relevant only in FREE-RUN mode. This is the maximum time period allowed for any transit. Let's suppose this parameter is set to 1000ms. If the VEGA system reads the car plate once, it still waits 1000ms before generating a transit event. During such time, the system keeps grabbing and processing images of the same vehicle whose car plate was read. This allows for a highly reliable car plate reading process.
During this same interval, the system may detect a vehicle with a different car plate number: such new transit event is immediately generated (no waiting for the 1000ms interval to expire) and the images subsequently acquired and processed must be related to as belonging to the new transit event.
Setting a too low MaxTimeTransit value means less images are processed for the same vehicle, which leads to lower reliability in OCR reading.
Therefore, MaxTimeTransit value should be set to the highest possible value while of course complying with the specific installation requirements.

The Min Time Same Plate ms and Enable Multi Out Same Plate function fields are strictly related.

Min Time Same Plate ms: It indicates two different things, depending on the value of the Enable Multi Out Same Plate parameter.

Meanings:

1) When **Enable Multi Out Same Plate is set to 0 (zero)**:
It represents the minimum length of time during which the camera will not create a transit event even if the number plate has been already recognized. In other words, for this length of time a previously recognized plate does not need be in the Vega field of action in order to generate another transit event. If the vehicle remains in the Vega field of action, the same plate recognition event is generated only once.

This configuration is useful when monitoring traffic along free-circulation roads: in case of queue, a single image for each vehicle is grabbed

2) When **Enable Multi Out Same Plate is set to 1 (one)**:
It represents the length of time that must elapse for generating a new transit event associated with a plate already recognized in the previous transit.

In this case, a vehicle that remains within the camera field of action will generate a transit event every *Min Time Same Plate.*

Time is expressed in milliseconds.
Typical values are: a few minutes in the first case described (120000 ms) and a few seconds for motorized barrier configurations (5000 ms).

Enabling this parameter may be helpful with motorized barrier gates as the transit event is likely to be periodically sent when a vehicle is standing in front of the barrier while waiting.
For example, in LTZ implementations this parameter should be disabled, so that any vehicle parked inside the camera frameview does not continuously generates a transit event.

Image Selection Mode: It indicates the selection mode of the image containing the recognized plate associated with the transit. The possible values are:

- **FIRST_PLATE** - First image of the transit
- **LAST_PLATE** - Last image of the transit
- **BIGGEST_PLATE** - Image containing the biggest plate area).
- **BEST_LUMINANCE** - Image rating best average luminance in the car plate area. This is the default mode for transit image selection.

Last Transit Image

Using the WEB pages

Image Result

This page displays image and grabbing data of the last detected vehicle transit. The page is automatically and periodically reloaded so it is possible to keep open and view in real time the system results. Since the page is periodically being reloaded, it might happen that not all system-detected vehicle transits are displayed. So it happens that with heavy traffic, the refresh period is not capable of showing vehicles that actually transited.

Image Result

The page contains the image and grabbing data of the last detected vehicle transit.

Next to the image of the transit, the following data are displayed:

- **PLATE :** The car plate associated with the transit event.
- **COUNTRY :** Three-character string indicating the plate country of origin.
- **N. READ :** The number of images containing the read plate.
- **SHUTTER :** The exposure time, in microseconds, used for image grabbing.
- **STROBE :** The time period of activity, in microseconds, of the infrared illuminator during image grabbing.
- **GAIN :** The gain used for image grabbing.
- **CHAR WIDTH :** The width of the character, in pixels.
- **CHAR HEIGHT :** The height of the character, in pixels.
- **TIME :** The image grabbing time.
- **DATE :** The image grabbing date.

Character width and height are helpful when having to set the minimum and maximum values of character size in the "Plate Reader" web page.

Keep visualization of: The User can specify the image to be displayed in the window. The available options are: READ (plates that were read) and NOTREAD_NOPLATE (plates that have not been read or images containing no plate).

OCR Reading Text Results

Using the WEB pages


Text Result

This page displays the returned values of the OCR algorithm of each grabbed image.

Text Result

```
(10)   SA249BH ITA 0.954  (xc=523,yc=200,nb=17 gray=49) Gp=2
( 3)   SA249BH ITA 0.955  (xc=523,yc=200,nb=19 gray=49) Gp=2
( 8)   SA249BH ITA 0.951  (xc=523,yc=200,nb=19 gray=49) Gp=2
( 2)   SA249BH ITA 0.950  (xc=523,yc=200,nb=19 gray=49) Gp=2
( 9)   SA249BH ITA 0.960  (xc=523,yc=200,nb=18 gray=49) Gp=2
( 6)   SA249BH ITA 0.954  (xc=524,yc=200,nb=18 gray=49) Gp=2
( 4)   SA249BH ITA 0.958  (xc=523,yc=200,nb=18 gray=49) Gp=2
( 5)   SA249BH ITA 0.952  (xc=523,yc=200,nb=18 gray=49) Gp=2
(12)   SA249BH ITA 0.955  (xc=523,yc=200,nb=17 gray=49) Gp=2
( 1)   SA249BH ITA 0.953  (xc=523,yc=200,nb=23 gray=49) Gp=2
( 0)   SA249BH ITA 0.955  (xc=523,yc=200,nb=18 gray=49) Gp=2
(11)   SA249BH ITA 0.954  (xc=523,yc=200,nb=17 gray=49) Gp=2
( 7)   SA249BH ITA 0.954  (xc=523,yc=200,nb=18 gray=49) Gp=2
(10)   SA249BH ITA 0.954  (xc=523,yc=200,nb=20 gray=49) Gp=2
( 3)   SA249BH ITA 0.955  (xc=523,yc=200,nb=19 gray=49) Gp=2
( 8)   SA249BH ITA 0.947  (xc=523,yc=200,nb=18 gray=49) Gp=2
( 2)   SA249BH ITA 0.952  (xc=523,yc=200,nb=17 gray=49) Gp=2
( 9)   SA249BH ITA 0.954  (xc=524,yc=200,nb=19 gray=49) Gp=2
( 6)   SA249BH ITA 0.961  (xc=523,yc=200,nb=18 gray=49) Gp=2
( 4)   SA249BH ITA 0.947  (xc=524,yc=200,nb=18 gray=49) Gp=2
( 5)   SA249BH ITA 0.958  (xc=523,yc=200,nb=18 gray=49) Gp=2
(12)   SA249BH ITA 0.956  (xc=523,yc=200,nb=18 gray=49) Gp=2
( 1)   SA249BH ITA 0.957  (xc=523,yc=200,nb=17 gray=49) Gp=2
( 0)   SA249BH ITA 0.958  (xc=523,yc=200,nb=17 gray=49) Gp=2
(11)   SA249BH ITA 0.958  (xc=523,yc=200,nb=20 gray=49) Gp=2
( 7)   SA249BH ITA 0.954  (xc=523,yc=200,nb=20 gray=49) Gp=2
(10)   SA249BH ITA 0.954  (xc=523,yc=200,nb=17 gray=49) Gp=2
```

The last row in the Text page reads as follows:

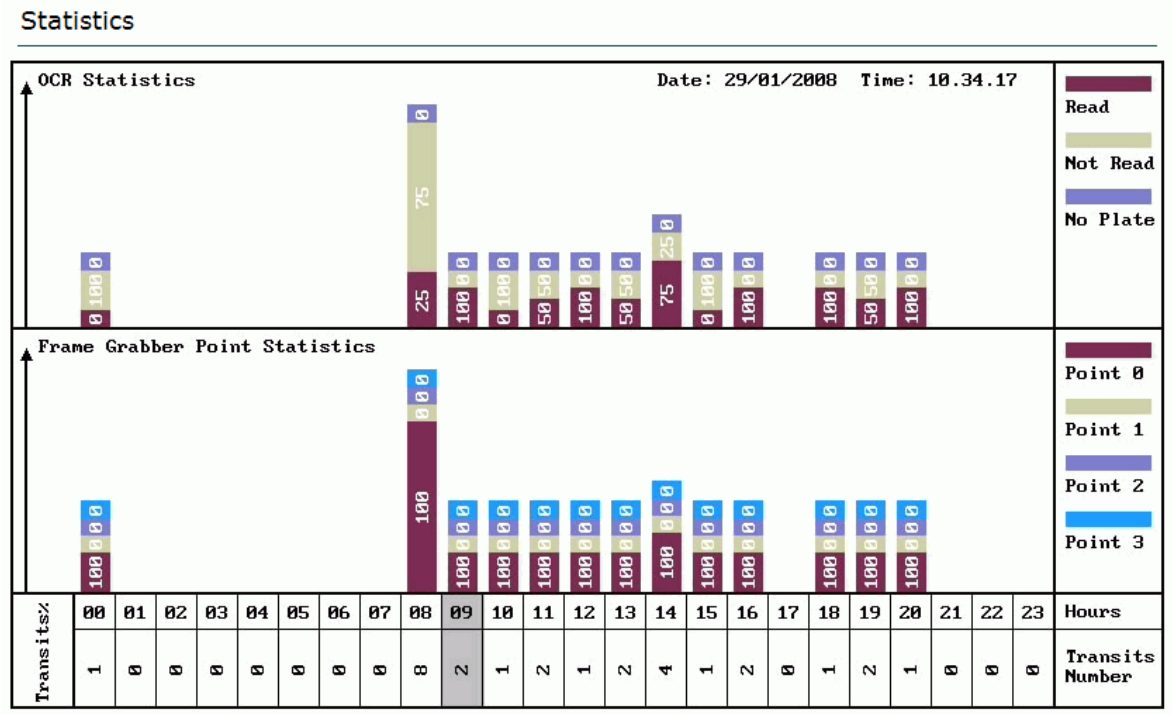
SA249BH	Vehicle Car Plate Number
ITA	Car plate Country of Origin
0.954	OCR Reading Score (value between 0 and 1)
xc=523	xc: X-coordinate of car plate center with respect to the upper left corner of the image. Value is in pixels.
yc=200	yc: Y-coordinate of car plate center with respect to the upper left corner of the image. Value is in pixels
nb=17	nb: Number of possible characters (i.e. blobs) examined by the OCR. It is expressed as numerical value
gray=49	Average Gray Level of the image
Gp=2	Index of the work point used for image grabbing

OCR Reading Statistics

Using the WEB pages

Statistics

This page contains the statistics for OCR returned values in the last 24 hours of operating



These values are useful when installing and optimizing the VEGA machine.

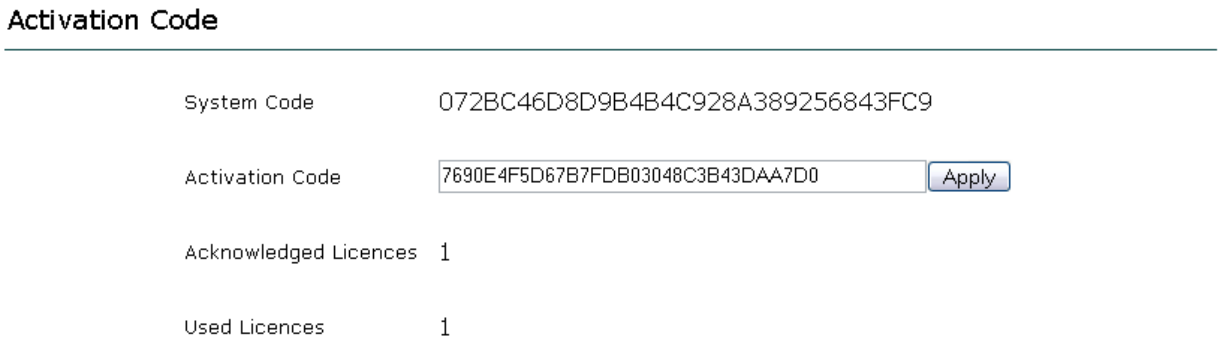
The upper part of the "OCR Statistics" image contains the percentage of the transits that have been recognized as READ, NOT READ or NO PLATE.
The lower part, "Frame Grabber Point Statistics", contains the percentage of readings for the 3 different points of image grabbing.

This allows viewing, at any time of the day, how many transits have been detected as well as what grabbing points were used in order to save the images.
Using this information, the User can evaluate whether the grabbing settings used are correct and consistent and calculate the transit recognition rate.

OCR Libraries Activation Code

Using the WEB pages

This page is used for managing and activating the licenses of VEGA OCR libraries.



System Code: This is the univocal identifying code of the hardware and the number of countries the current firmware version is able to recognize. To check the list of countries the firmware in use is able to read, please refer to *Device Info, OCR lib version* row. In the example here below, "OCRP Lib. Ver. OCRP 8.7 ITA" indicates the unit has one OCR library, for Italian car plate number reading only.

Activation Code: It indicates the built-in and factory-set activation code. This code is hardware-related and cannot be used on physically different machines.

Acknowledge Licenses: This is the numerical value that represents the number of licenses installed on the machine. For a correct system performance, the number of licenses must be equal to or higher than the number of countries the system is capable of reading (Used Licenses).

Used Licenses: This is the numerical value that represents the countries the firmware is capable to read. E.g.: 1, 2, 3…
….

About licenses and work procedures

Thanks to the introduction of Activation Codes (as of now, AC); the same VEGA machine is capable of reading several countries' car plates.

In order to read car plates from N countries (N >1), the User must own N licenses.

The AC contains information about the number of licenses owned.

The AC is associated with the specific VEGA machine for which it was generated and cannot be copied neither pasted from/to different VEGA systems.

The number of AC licenses in no way depends on the type of countries activated: if the VEGA machine in use has 2 licenses and reads ITA and FRA car plates, it is possible to install on the same VEGA device an additional software for reading any other pair of countries.

The same is true if the VEGA device software reads only 1-country car plates: in this case, the license number (Acknowledge Licenses = 2) is higher than the number of countries the firmware is allowed to read (User Licenses = 1).

Be aware that when trying to install a multiple-country reading firmware on a 1-activated license VEGA, the system is not going to work.

The User is still allowed to access the web server but the system is not going to carry out any of the planned actions. On the main page and in the Activation Code page, the User views a red message.

In order for the system to be enabled, the User must contact his/her retailer and ask for the activation code while giving his/her system code.

Tattile VEGA systems are provided with a default 1-activated license AC.

Upon first installation (on a brand new machine or on an older machine not equipped with the activation code management), the firmware automatically generates a 1-license AC.

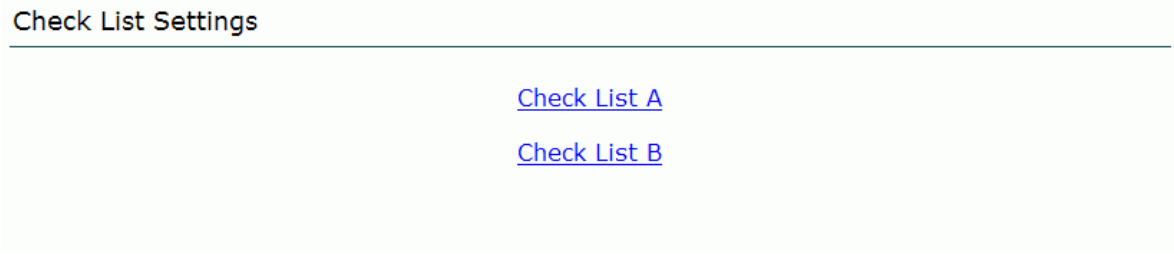
The system code must be sent to Tattile AFTER the software update was installed in Vega.

Using car plate lists

Using Web pages

Check List

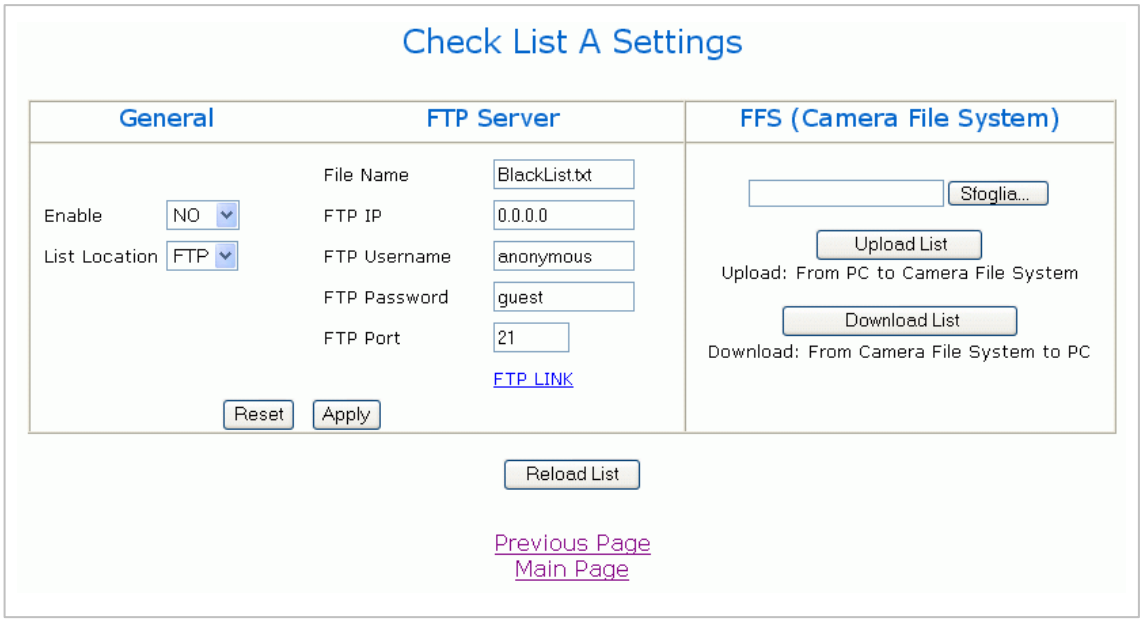
The Check List page contains the following fields:



Select either Check List A or Check List B.

List A and List B setups are identical. For practical reasons, the description that follows relates to List A only.

The Check List A page contains the following fields:



The car plate checklist can be stored either on the Flash memory of the VEGA machine or on a remote FTP server.
The checklist is loaded to the VEGA unit RAM memory upon system startup.

It is possible to modify and update in real time the car plate lists located in the FTP server or in the Flash memory of the VEGA unit.

To load the new list to the RAM memory right after changes were made, press the **Reload List** button.

The file that contains the car plate lists (List A and List B) must comply with the following syntax:

```
Vehicle Car Plate; Country of Origin; Comment String

The system will ignore any irrelevant spaces.
The  ; (semi-colon) sign must be used to separate fields.
To represent the Country of Origin three CAPITAL LETTERS must be used.
```

Example
AB134HK;ITA; Test
BS46588;ITA; Substitute Car
RS054HG;ITA; President's Car

In order for the last row of the file to be loaded too, a full stop sign must be typed at the end of the line.
The comment string maximum length is 64 characters. Longer comment strings will be truncated.

When loading the checklist to the Flash File System of the VEGA unit, the maximum file size allowed is 200KBytes. A file that contains 10000 car plates takes up about 32Kbytes (this size varies depending on car plate/comments length).

Countries must be always indicated by three characters. The following table shows some country initials:

European plates

Codice	Nazione
AUT	Austria
BEL	Belgium
BGR	Bulgaria
CYP	Cyprus
DNK	Denmark
EST	Estonia
FIN	Finland
FRA	France
DEU	Germany
GRC	Greece
IRL	Ireland
ITA	Italy
LVA	Latvia
LTU	Lithuania
LUX	Luxembourg
MLT	Malta
NLD	Netherlands
POL	Poland
PRT	Portugal
GBR	Great Britain
CZE	Czech Republic
ROU	Romania
SVK	Slovakia
SVN	Slovenia
ESP	Spain
SWE	Sweden
HUN	Hungary
CHE	Svizzera

Targhe Extra-Europee

Codice	Nazione
AUS	Australia
IND	India
KSA	Arabia Saudita (Kingdom of Saudi Arabia)
MAR	Morocco
MEX	Mexico
RSA	Republic of South Africa
UAE	United Arabic Emirate
ARG	Argentina
COL	Colombia
TUR	Turkey
RUS	Russia
BHR	Barhein
ISR	Israel

Targhe "Speciali"

Codice	Nazione
ADR	Dangerous Goods
CON	Container (ISO code)

General

Enable:
It enables the use of the checklist.

List Location:
It allows setting the position of the lists in the available memories (internal or external). When in FTP mode, the VEGA unit is to refer to a plate list residing on an external server. When in FFS (Flash File System) mode, the plate list is to be loaded into the VEGA Flash memory.

FTP Server

File Name:
It allows setting the name of the first list of car plates. The file name and its extension must correspond to the file name residing on the server.

FTP IP:
The FTP Server IP addresses.

FTP Username:
The Username of the FTP server user.

FTP Password:
The password of the FTP server user.

FTP Port:
The port of the FTP server.

FFS (Camera Flash File System)

Browse:
This feature allows selecting (in the PC drives or on the local network) the position of the text file containing the A or B list of car plates to check, so that it is ready to be sent to the VEGA machine.

Upload List:
The Upload List feature allows sending to the VEGA machine the car plate list previously selected using the Browse feature.

Download List:
The Download List feature allows downloading from the VEGA machine the car plate list (as .TXT file). Such list is read by Vega RAM memory.

Using the VRC server

This command reloads to Vega RAM memory the plate list files. List Management must be enabled in order for this operation to be carried out. If List management is not enabled, the VRC server response is an error message.

Reload JPG Plate Lists *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35000 Reload List A 35001 Reload List B
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Reload JPG Plate Lists *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35000 Reload List A 35001 Reload List B
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

The following command allows reading the plate list currently loaded in Vega RAM memory.

Read JPG Plate Lists *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35002 Read A List 35003 Read B List
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Read JPG Plate Lists *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35002 Read A List 35003 Read B List
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	20 + LIST_SIZE
4	DataCode	13208
4	DataSize	4
4	DataBuffer	Number of plates in the list
4	DataCode	13209
4	DataSize	LIST_SIZE=List Size in bytes
LIST_SIZE	DataBuffer	String containing plate lists

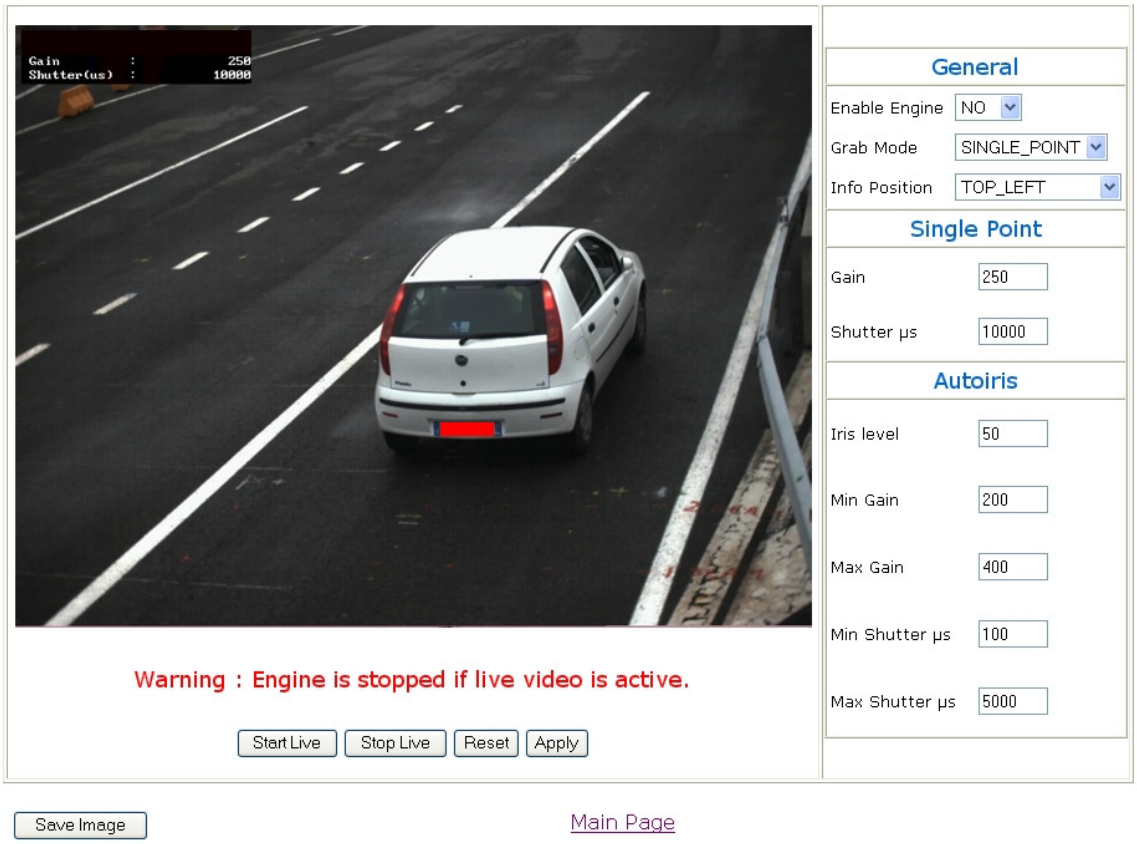
The string with the plate list (DataBuffer corresponds to DataCode 13210) is formatted as follows: *Plate Number; Country of origin; Comment.*

Example:

```
ZF333CX;ITA;Auto rossa test1
GF345LL;ITA;Auto test2
DD876BU;ITA;Auto test3
```

Color Context Camera

The Context Camera page contains the following fields:



This page is available only on VEGA number plate readers. For a description of models with embedded context camera, please refer to the Installation Guide.

The context camera is used to grab a color image that matches the black/white image taken by the machine head used for reading the car plate.

When the context camera is active (Enable Engine: YES), upon car transit the corresponding color image is automatically saved to the FTP server (see paragraph "Save Image to FTP server") and add the color image to the data packet sent to TCP/IP socket (see paragraph "Send Message to TCP/IP Socket").

The color context image name differs from the car plate b/w image name by the **_CTX** character sequence at the end of the file name.

The right side area of the page contains the following fields:

General

Enable Engine: Its possible values are either **YES** or **NO**. It enables or disables the processing of images grabbed by the context camera. When set to **NO**, the context camera is disabled and images are not available for system actions/events.

Grab Mode: In this section it is possible to set the image-grabbing mode. The available modes are: **SINGLE_POINT or AUTOIRIS.**

The context camera operating mode should be Autoiris. The single-point mode is available for setting up the autoiris mode parameters purposes.

Info Position: In this section it is possible to specify, inside the live image, where the overlay of the grabbing parameters (gain and exposure time) will be positioned.

Single Point

In this section, it is possible to set the parameters to use in **SINGLE_POINT** grabbing mode.

When using this mode, each image grabbing uses the following parameters:

- **Gain:** It indicates the gain.
- **Shutter us:** It indicates the exposure time in microseconds.

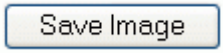
Autoiris

When in autoiris mode, the system automatically adjusts the grabbing parameters based on external lighting condition so as to keep a stable image luminance. The following fields are available for managing these parameter variance limits:

- **Iris level:** It indicates the level of image brightness. The allowed values range from 1 to 100. Set a higher value to brighten the image or a lower value to make it darker.
- **Min Gain:** It indicates the minimum gain value allowed to use in the Autoiris algorithm.
- **Max Gain:** It indicates the minimum gain value allowed to use in the Autoiris algorithm.
- **Min Shutter us:** It indicates the maximum gain value allowed to use in the Autoiris algorithm.
- **Max Shutter us:** It indicates the minimum exposure time, in microseconds, allowed using in the Autoiris algorithm.

At the page bottom, the following function buttons are available:

Start Live: It allows starting live video.
Stop Live: It allows stopping live video.
Reset: Press this button to cancel values that have been already typed in but not confirmed yet using the Apply button.
Apply: Use this button to implement changes entered in this page.



The "Save Image" button allows saving to PC the image currently displayed and grabbed by the color context camera. The image is in JPEG format.

Engine is stopped if live video is active and while live images are displayed on the Context Camera page and this means no event is available. Processing is automatically reactivated upon exit from the Context Camera page.

Using the VRC server

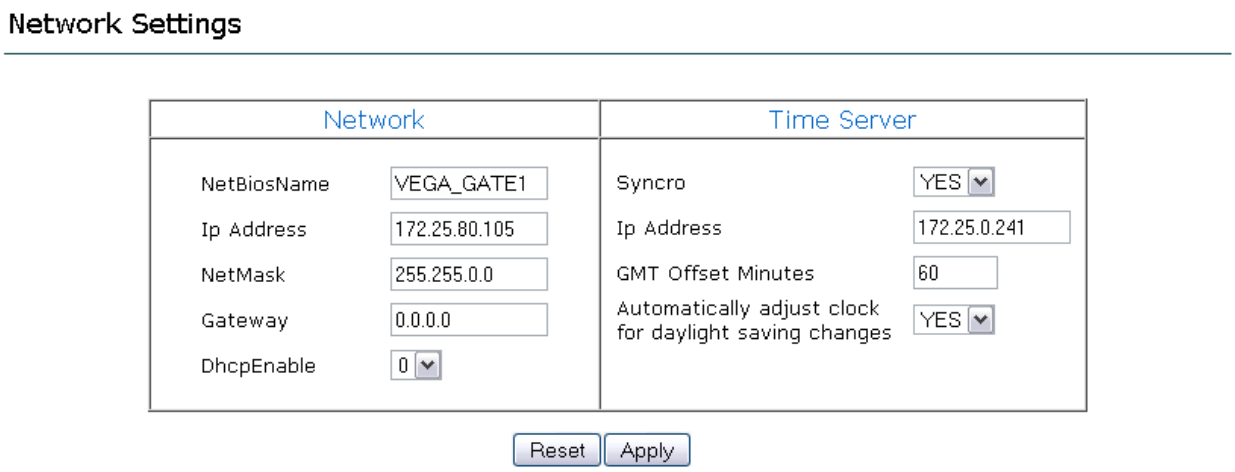
It is possible to acquire color camera JPEG images from the VRC server. See paragraph "Image Grabbing" for details.

Network Interface Configuration

Using the Web pages


Network

The Network Settings page contains the following fields:



Warning: changes in these settings will briefly interrupt this browser connection. Refresh this screen to reconnect.

Network

NetBiosName:
It allows setting the name of the VEGA machine. It is possible to enter alphanumeric values in this field. Spaces must be represented by "_" (underscore).

Ip Address:
It allows setting the IP address of the VEGA machine.

NetMask:
It allows setting the network net mask.

GateWay:

It allows setting the gateway IP address.

DhcpEnable:
It allows enabling/disabling automatic acquisition of IP addresses.

Changing any parameter in **Network Settings** page causes the machine to reset. During reset the connection to the browser will not be available for about 10 seconds. Confirmation is asked before reboot.

Date and Time Control

Using the Web pages


Network

Network Settings

Network		Time Server	
NetBiosName	VEGA_GATE1	Syncro	YES
Ip Address	172.25.80.105	Ip Address	172.25.0.241
NetMask	255.255.0.0	GMT Offset Minutes	60
Gateway	0.0.0.0	Automatically adjust clock for daylight saving changes	YES
DhcpEnable	0		

Reset Apply

Warning: changes in these settings will briefly interrupt this browser connection. Refresh this screen to reconnect.

Time Server

VEGA Time Server feature uses the SNTP protocol (Simple Network Time Protocol) when synchronizing to a remote Time Server (Server/PC that serves as reference clock).

Syncro:
This feature enables/disables the synchronization to an external timeserver. Toggle values are: YES/NO.

Ip Address:
It indicates the IP address of the Time Server unit the VEGA machine uses as reference when synchronizing its internal clock.

GMT Offset min:
It indicates the minutes to be added to the time received from the server, in order to offset between "Greenwich Mean Time" (prime meridian) and local time. This value is expressed in minutes and can be negative.
See **http://wwp.greenwichmeantime.com** for further details on time zones for different countries around the world.

Automatically adjust clock for daylight saving changes
If set to YES, it automatically handles switching between daylight-saving time and local standard time.

Changing any parameter in **Network Settings** page causes the machine to reset. During reset the connection to the browser will not be available for about 10 seconds.

The SysStatistics page contains statistics about synchronization with the SNTP server.

Using the VRC server

This command allows reading Vega current date and time in addition to other information about time zone and standard/daylight saving time.

Read Date and Time *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	26011
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Read Date and Time *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	26011
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	44
4	DataCode	12026
4	DataSize	12
12	DataBuffer	Date GMT Time 1byte: day

		1byte: month 2bytes:year 2bytes:hour 2bytes:minutes 2bytes:seconds 2bytes:milliseconds
4	DataCode	10037
4	DataSize	4
4	DataBuffer	GMT Offset in minutes
4	DataCode	10041
4	DataSize	4
4	DataBuffer	1 for daylight saving time 0 for standard time

Add to the received GMT time the GMT offset to obtain the current local time. If the daylight saving time item shows 1, it is necessary to add 60 minutes.

This command allows setting the date and the time, the GMT offset. It also enables/disables the automatic switch to daylight saving time. Data about GMT offset and switch to daylight saving/standard time are permanently saved to Vega file system, so that these settings will not be lost in case of unit reboot. All Vega systems are provided with a Real Time Clock (RTC) with buffer battery: this allows keeping the time updated even when the machine is off.

Write Date and Time *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	26010
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	44
4	DataCode	12026
4	DataSize	12
12	DataBuffer	GMT Date and Time 1byte: day 1byte: month 2bytes:year 2bytes:hour 2bytes:minutes 2bytes:seconds 2bytes:milliseconds
4	DataCode	10037
4	DataSize	4
4	DataBuffer	GMT Offset in minutes
4	DataCode	13210
4	DataSize	4
4	DataBuffer	1=Enable switch to daylight saving time

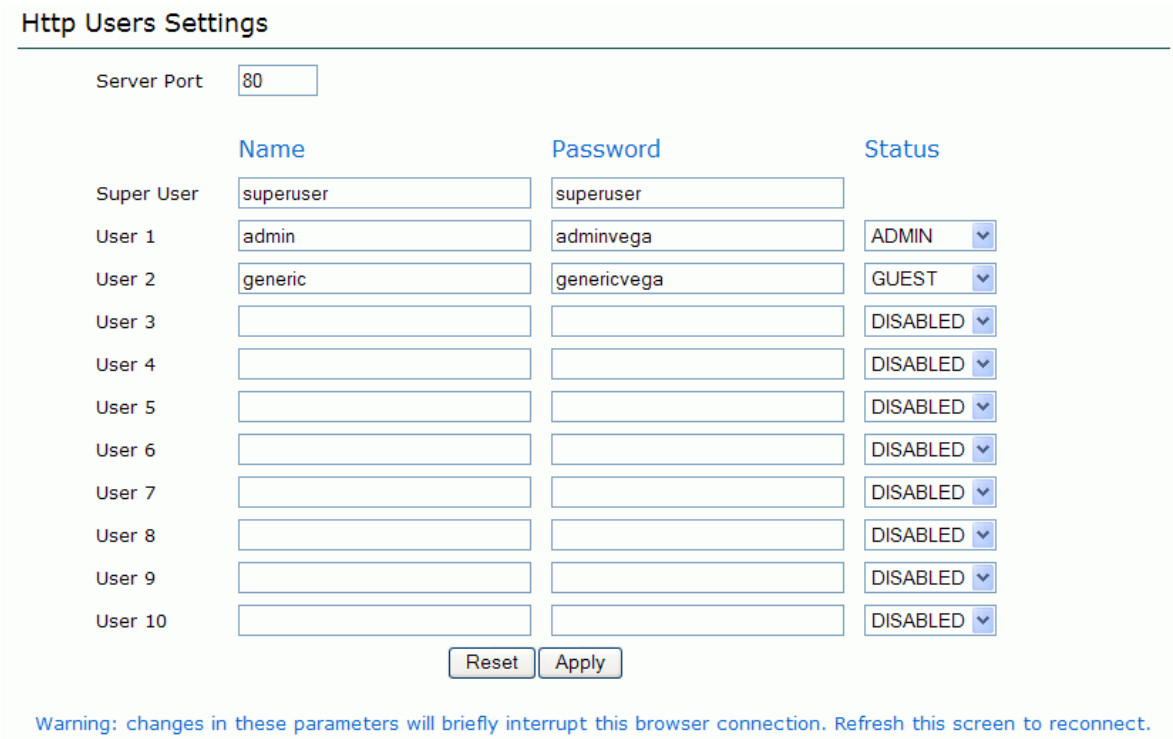
Write Date and Time *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	26010
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	24

Managing Web Server Users

Using the Web pages

HTTP Users

The HTTP Users page contains the configuration settings of the users who access the unit via a browser. In this section, the User is allowed to enter and update the Username and Password codes of the Super user, Administrator and Operator categories.



Access to HTTP Users page is granted to the Super User only, who is allowed to enable, disable or delete users or to assign new passwords.

Server Port
The port where the http server is open. Default value is 80.

The **Administrator** user has the rights to modify any VEGA operational parameters but is not allowed to access the HTTP Users page.

The **Operator** is only allowed to view the system parameters, except for the HTTP Users page.

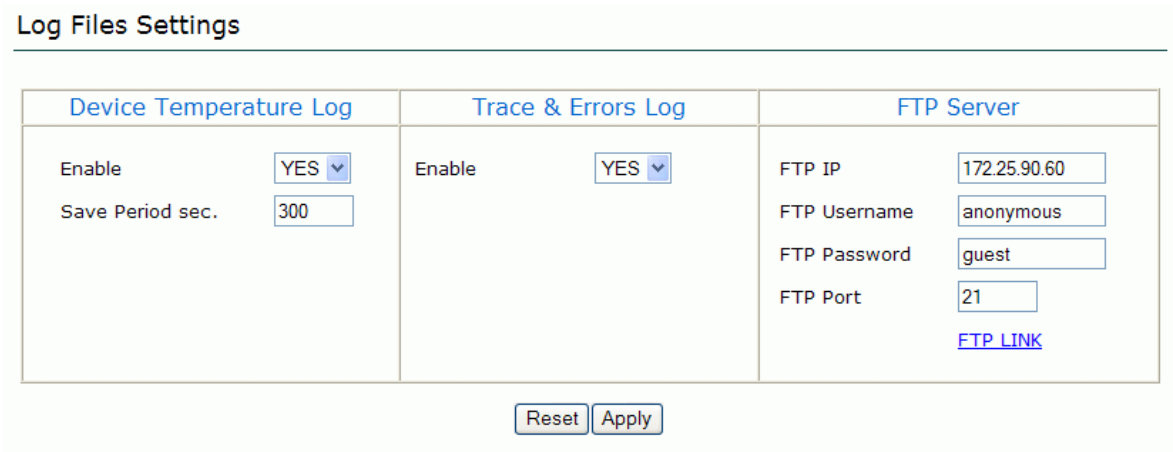
The system can be assigned up to 10 Administrator / Guest users and one only Super use.

Trace and Temperature Log on FTP Server

It is possible to save to FTP Vega internal temperature and traces/errors generated during operating.

Using the Web pages

Log Files



Both the log file and the file showing the device temperature are saved to a folder on the FTP server. This folder name is made up by the IP address of the VEGA machine. For example: if the IP address is 172.25.90.65, the name of the folder for file saving is LOG_172_25_90_65.

Device Temperature Log

Enable: It enables/disables the log file saving. This log file contains data about the internal temperature of the VEGA machine. The file is saved on an FTP server. Use the ***FTP Server*** window to configure the server parameters. For each day, a file is generated. Its name contains the IP address and relevant date, e.g. *172_025_090_065_Temperature_2007_10_01.txt*
File data format is as follows:

```
09.10.59 01/10/2007 30.49 °C
09.21.03 01/10/2007 31.05 °C
09.31.07 01/10/2007 31.61 °C
09.36.08 01/10/2007 31.80 °C
09.41.09 01/10/2007 32.11 °C
```

Save Period Sec.: It allows specifying the period in seconds for log file updating rate.

Trace & Errors Log

Enable: It enables/disables log file saving. This log file contains data about the start up of the machine and on any malfunctioning. This file is saved on a remote FTP server. Use the **FTP Server** column to configure the remote FTP server parameters. The file name contains VEGA IP address and the relevant date, e.g. *172_025_090_065_Errors_2007_10_02.txt*

FTP Server

FTP IP: The FTP server IP address.

FTP Username: The user name of the FTP server user.

FTP Password: The password of the FTP server user.

FTP Port: The port of the FTP server.

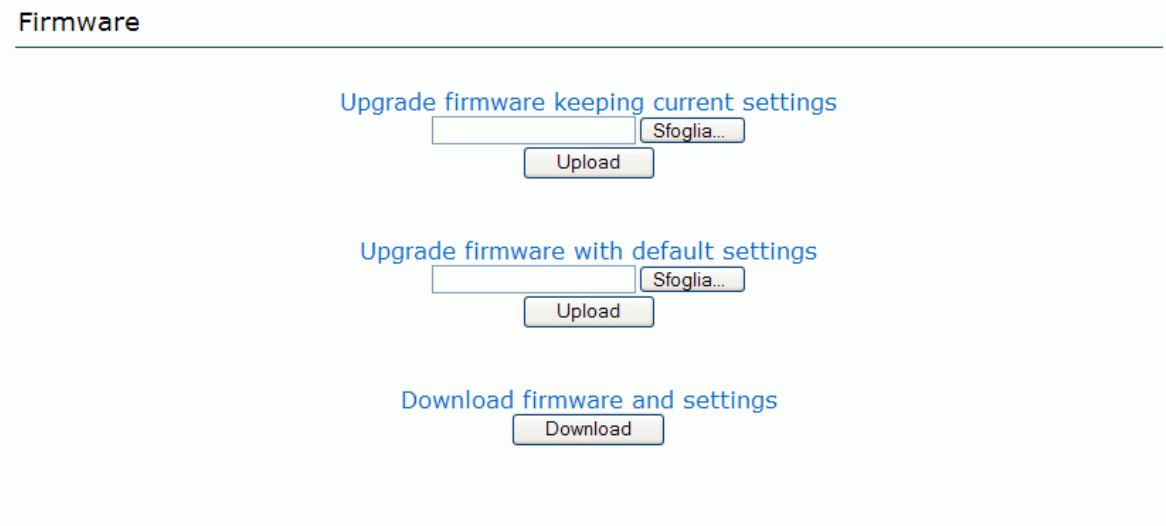
Firmware Update

It is possible to update Vega software. The update requires one file only, where operating system, application and configuration file are integrated. The file is distributed as .bin. For example, *VegaConfig_5_03_ITA_Install_Pack.bin* is the software update to 5.03 version for Italian car plates reading.

Using the Web pages

Firmware

This page contains the commands for updating the camera software.



Two updating methods are available:

1) Upgrade firmware keeping current settings:
In this section, the update is carried out without changing the previously configured parameters. Press the ***Browse*** button and select the update file from the PC file list (the update file is a **.bin** file of about 2 Mbytes size).
Once this file has been selected, press the ***Upload*** button and confirm the operation.
When update completes, the User is asked to reboot the VEGA machine by pressing the ***Reset*** button displayed on screen.

2) Upgrade firmware with default settings:
In this section, the upgrade is carried out by deleting all user-defined parameters and reloading the default settings of the new .BIN file just loaded using the Browse and Upload command sequence. This procedure is the same as the one previously described.

We recommend using the Internet Explorer browser when updating the software. Using other browsers, the updating procedure does not work and causes problems with Vega software.

During update it is very important to make sure the camera is not powered off.
Please do NOT close the http connection until the download operation is completed.

Anyway, this software updated never changes the settings of the system network interface (the parameters found in Network Settings page).

Download firmware and settings procedure:

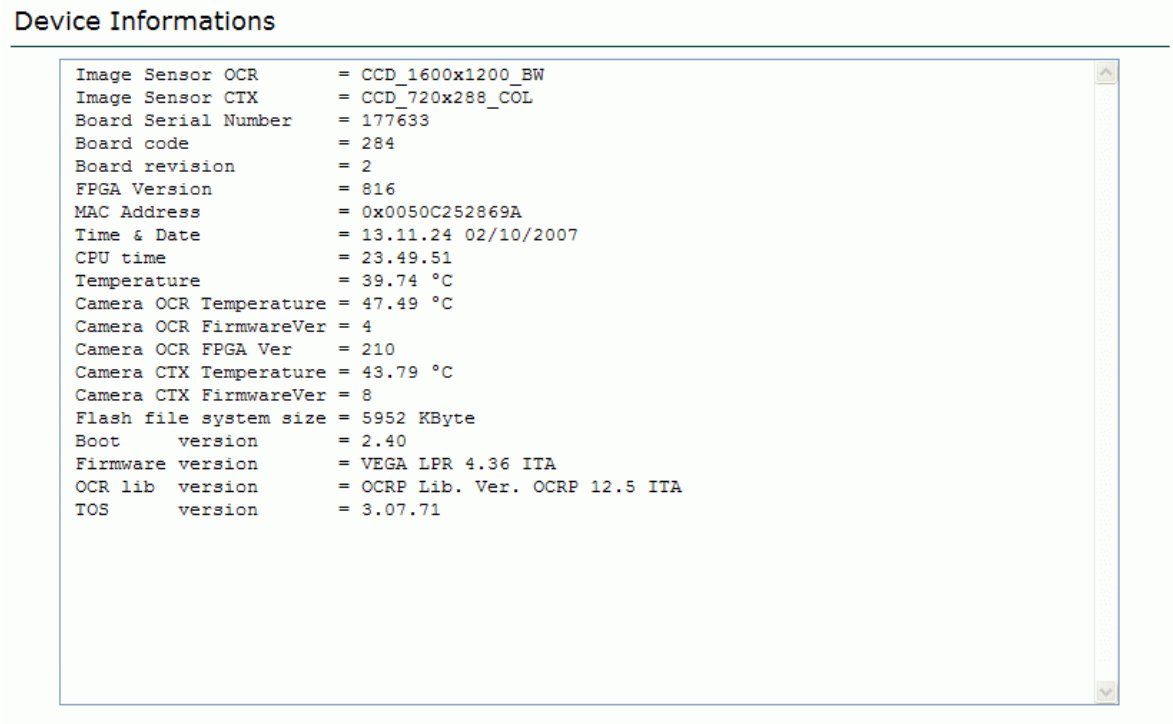
Press the download button to save to PC a .zip file containing the Vega firmware and all its user-defined parameters.
This feature is very useful when duplicating the same configuration onto another device or keeping the file for backup purposes. The .zip file can be directly loaded to a Vega system, using either of the available upgrade options.

Device Information

Using the Web pages

Device Info

This page displays VEGA software and hardware information. In the example that follows, information relates to a VEGA plus system having a context camera.



Description of the main information contained in this page:

Image Sensor OCR	The reading sensor typology and its resolution
Image Sensor CTX	The context sensor typology and its resolution
Board Serial Number	Main Board Serial Number
Board Code	Main Board Type Identification Number
Board Revision	Board release identification number
FPGA Version	FPGA Version Identification Number
MAC Address	MAC identification number of the unit (physical address of the network board)
Time & Date	Current Time and Date
CPU time	Hours, minutes and seconds elapsed since last device boot

Temperature	Internal temperature, near the device main board
Firmware version	Firmware version of the machine **(the version specified here is sufficient to univocally identify the software loaded in the unit)**
OCR lib. version	OCR Library Version
TOS version	Operating System version

Using the VRC server

Request of information about the device.

Device Info *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35010
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

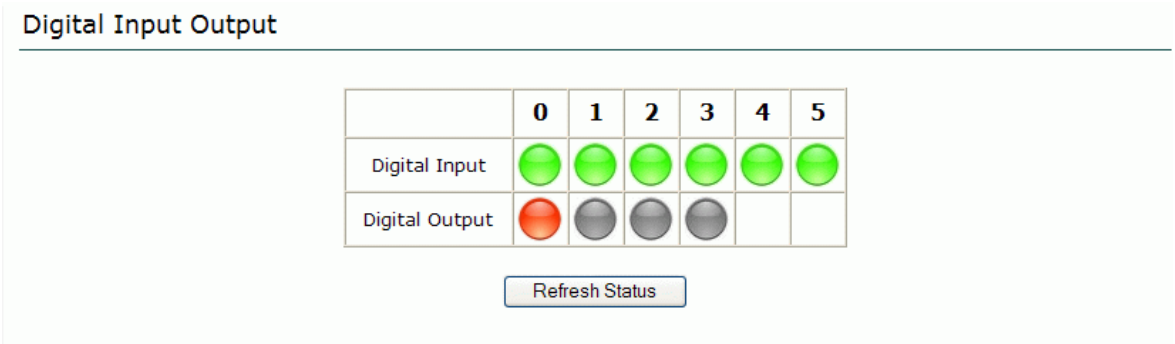
Device Info *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	35010
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	80 + STR_LEN
4	DataCode	12000
4	DataSize	4
4	DataBuffer	Board Serial Number
4	DataCode	12013
4	DataSize	4
4	DataBuffer	Board Code
4	DataCode	12014
4	DataSize	4
4	DataBuffer	Hardware Board revision
4	DataCode	12019
4	DataSize	4
4	DataBuffer	Board Temperature – tenths of °C
4	DataCode	12020
4	DataSize	4
4	DataBuffer	FPGA Version
4	DataCode	12010
4	DataSize	STR_LEN
STR_LEN	DataBuffer	String containing description and firmware version
4	DataCode	12040
4	DataSize	4
4	DataBuffer	Number of video channels (1 or 2 depending if context camera is installed)

Digital Inputs and Outputs

Vega systems have embedded digital inputs and outputs. Outputs are used for monitoring external devices; inputs are used as trigger sources. It is possible to check and modify the status of digital outputs. This function is useful when checking the cabling upon installation: it makes sure that when switching the input on the Vega system detects it and checks that all external devices connected receive the signal when the outputs are enabled.

Using the WEB pages

Digital IO



This page allows monitoring the state of the video camera digital inputs and enabling the digital outputs.
The green input icon indicates the input is high. The red output icon indicates the output is high.

Click on the digital output icon to change its status.

Click on the "Refresh Status" button to update the input and output logical status.

Using the VRC server

This command allows reading the state of all digital inputs and outputs.

Read Input and Output State *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	25134
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Read Input and Output Status *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	25134
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	48
4	DataCode	12041
4	DataSize	4
4	DataBuffer	Number of digital inputs
4	DataCode	12043
4	DataSize	4
4	DataBuffer	State of digital inputs
4	DataCode	12042
4	DataSize	4
4	DataBuffer	Number of digital outputs
4	DataCode	12044
4	DataSize	4
4	DataBuffer	State of digital outputs

The state of digital inputs and outputs is a 32-bit long variable. The least significant bit corresponds to input or output # 0. As a rule, if a bit has value 1 it means the output or input is active.

This command allows starting or stopping a digital output.

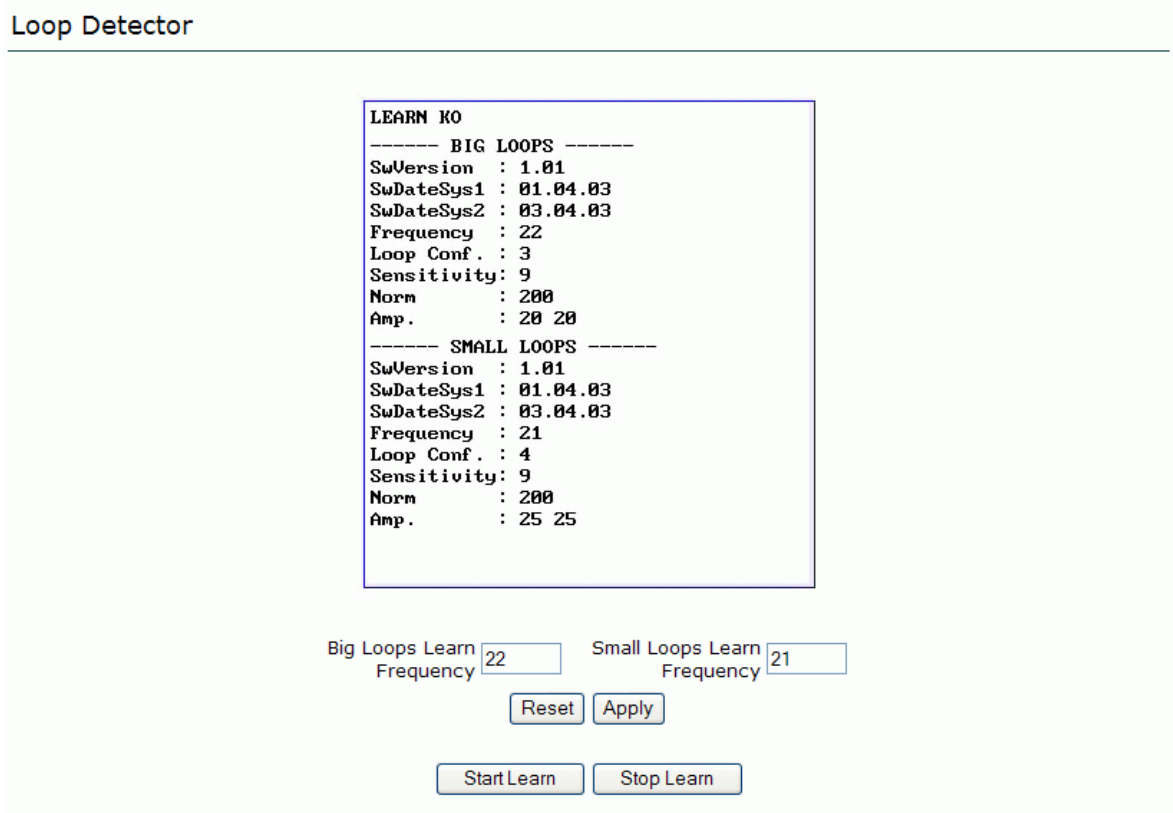
Start Stop Digital Outputs *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	25051 Output ON 25052 Output OFF
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	12
4	DataCode	12062
4	DataSize	4
4	DataBuffer	Digital Output Number

Start Stop Digital Outputs *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	25051 Output ON 25052 Output OFF
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

The "digital output number" parameter takes values from zero included up to NUM_OUTPUT-1 value, where NUM_OUTPUT is the number of digital outputs of the Vega machine. It is possible to retrieve this value from the 'read input and output states' message (CommandCode 25134).

Speed Detection using Loop Detector

The loop system is available on VEGA Plus devices only. If the loop system is present, the firmware automatically detects it and inserts a Loop Detector icon in the system section of the main page.
Click on the icon to open the following web page:



For proper system operating, it is necessary to run the learning procedure at least once.
If the learning was not properly performed, the Loop Detector page displays the "LEARN KO" caption.

Press the Start Learn button to start the procedure. During this stage, the program displays the data of the transiting vehicles in the Loop Detector page.

At least a few dozens of car should transit in order for the learning procedure to be successfully carried out (other kinds of transportation, such as trucks or motorbikes are not counted for).

For details on how to install the loops, please refer to the Installation Guide.

Restart Unit

Using the VRC server

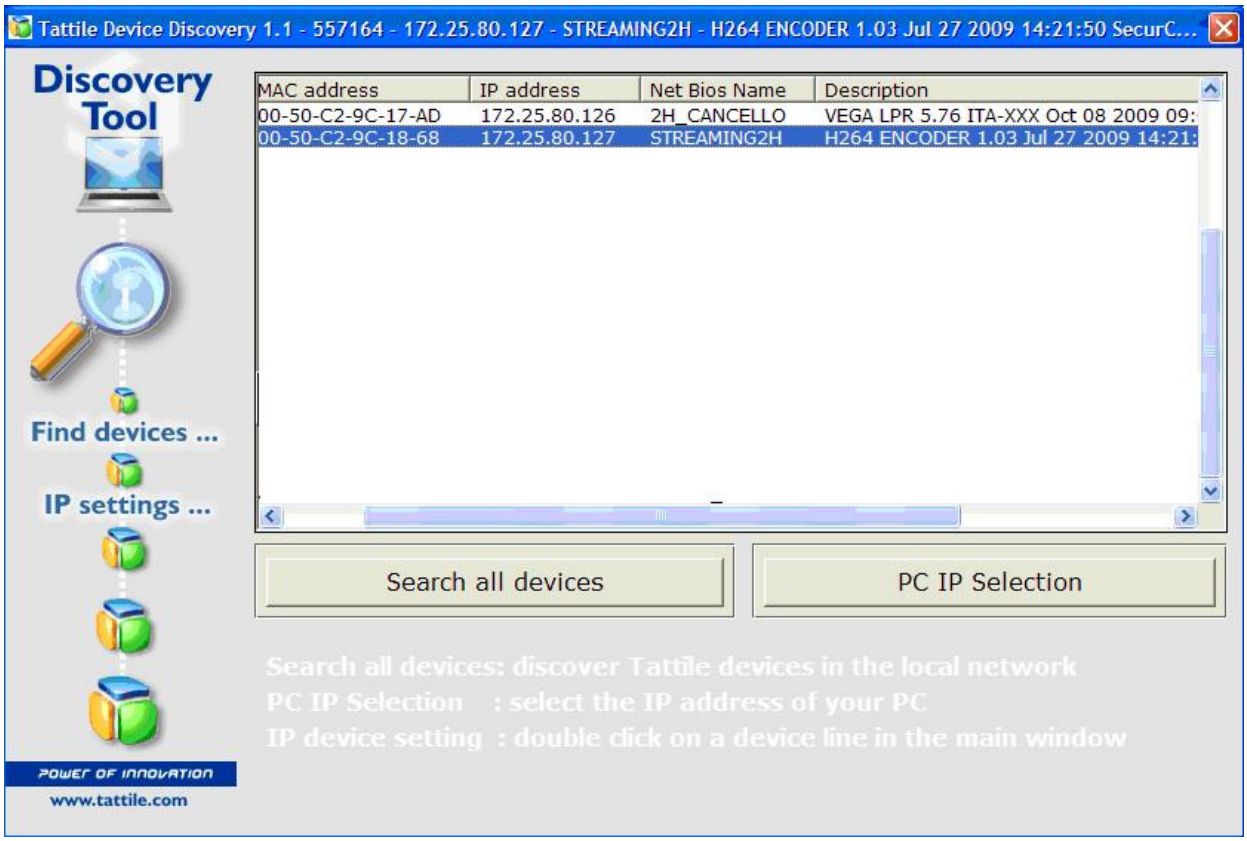
When sending this command, the unit CPU will reboot. Before restarting, an acknowledgment message is always sent to the client.

Restart Unit *CLIENT-->SERVER*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	26000
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

Restart Unit *SERVER-->CLIENT*		
Nr of bytes	**Description**	**Value**
4	Header Dimension	24
4	Command Code	26000
4	Sender	0xFFFFFFFF
4	Receiver	0xFFFFFFFF
4	Error	0
4	DataDimension	0

RTP Streaming

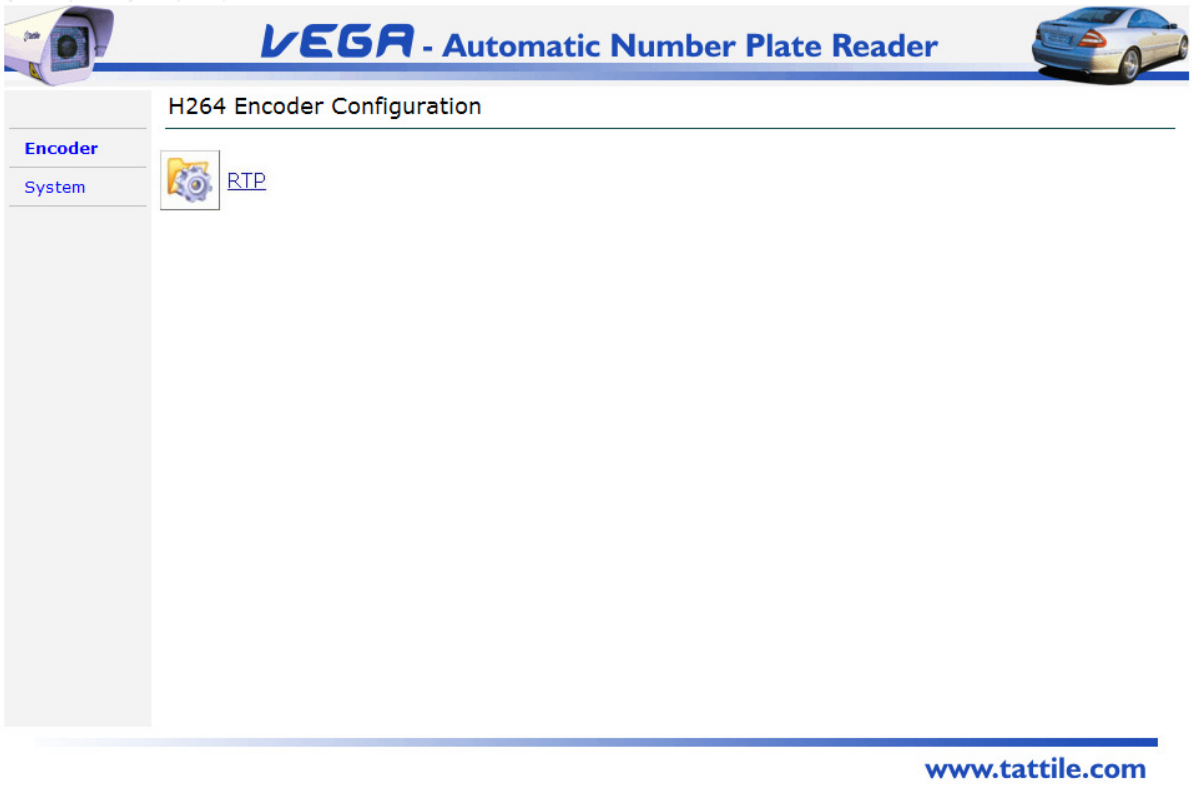
ONLY for VEGA 2H.
Vega 2H have a dedicated processor to generate a color Streaming video.
Dicovering the camera with the tool “Tattile device Discovery” will be found a double Ip address.
The device identificated with description “H264 Encoder” can be entered by web to configure the Streaming video.



To enter in the H264 encoder device use the usual default password:
user: superuser
password: superuser

The main page has 2 sub menu:

- **Encoder**, dedicated to the streaming video RTP settings
- **System**, with usual WEB functionalities as for Vega firmware.



The menu Encoder contains only the page "RTP" where is possible to set the streaming video up.

RTP Settings

RTP Streaming		SDP File	
Send	YES	FTP Notify	YES
Stream Format	MPEG4	FTP Server IP	172.25.6.101
Dest. IP	172.25.6.101	FTP Server Username	movies
Dest. Port	26000	FTP Server Password	movies
Bandwidth Control	YES	FTP Server Port	21
Bandwidth [Kbit/sec](*)	400	FTP Server Path	
Quality %(**)	50		
GOP	20		
Fps decimation ratio	1		
Streaming server	YES		
Streaming Server Conn. IP	172.25.6.101		

(*): only if Bandwidth Control is enabled.
(**): only if Bandwidth Control is disabled.

Reset Apply Send SDP

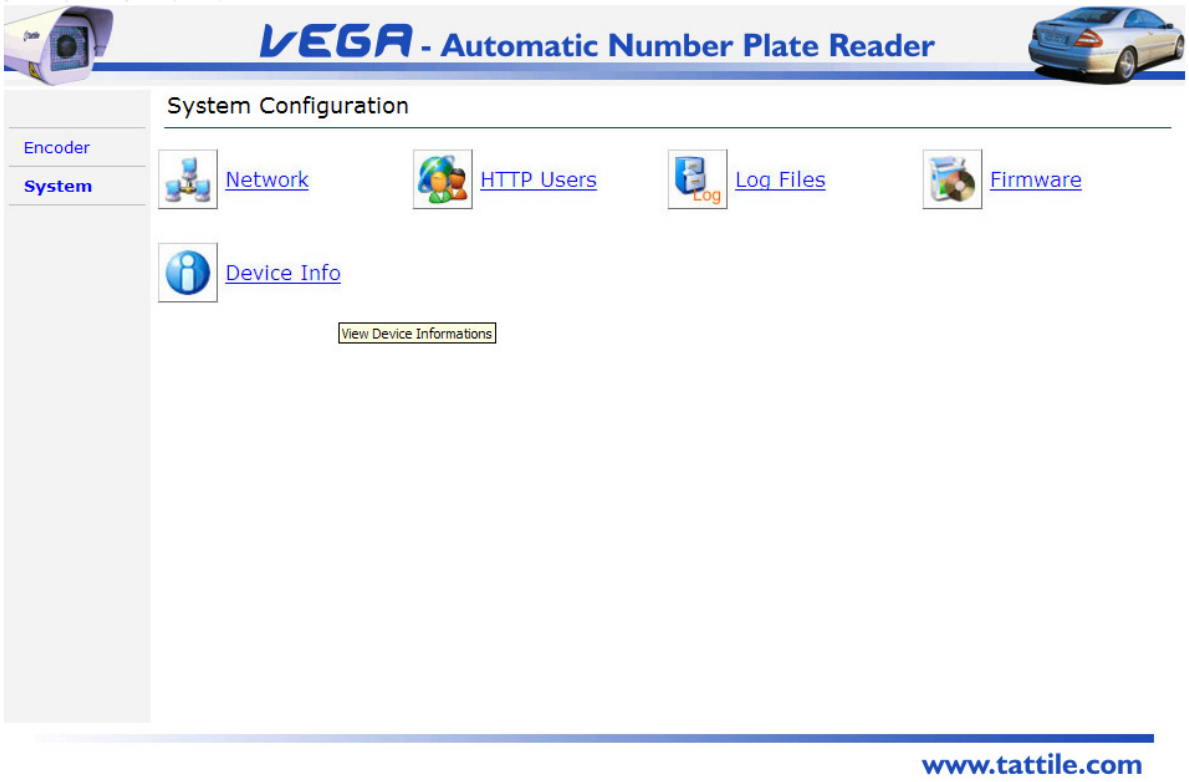
RTP is divided in RtpStreaming and SDp file.

RTP Streaming

- **Send:** *It allows to enable the sending of video streaming.*
- **Stream Format:** it is possible to choose between MPEG4 and H264
- **Dest. IP:** IP address of straming video destination
- **Dest. Port:** destination port
- **Bandwidth Control:** enable the bandwith control
- **Bandwidth [Kbit/sec]:** if Bandwith control is enable this value define the limit of the bandwidth.
- **Quality %:** defines the quality of the streaming video, ONLY if **Bandwidth Control** is disabled
- **GOP** (Group Of Picture): define the distance between frame I (intraframe), default 20 frames.
- **Fps decimation ratio:** frame decimation factor; 1 means no decimation (30 fps), 2 means 15 fps, 3 means 8 fps, etc…
- **Streaming server:** it allows to send video towards a Straming Video Server (for example Darwin Streaming Server)
- **Streaming Server Conn. IP:** Ip address of the Streaming Server

SDP File

- **FTP Notify NO YES:** it allows to create and sending a SDP file containing the infos that describe the video streaming. This is mandatory in order to grab and viedwthe streaming. **FTP Server IP:** Ip address of FTp server where to send the SDp file.
- **FTP Server Username:** username to write the file in the FTp folder
- **FTP Server Password:** password for the FTp server
- **FTP Server Port:** FTP port
- **FTP Server Path:** path where to write the SDP file



System contains the following functionalities:

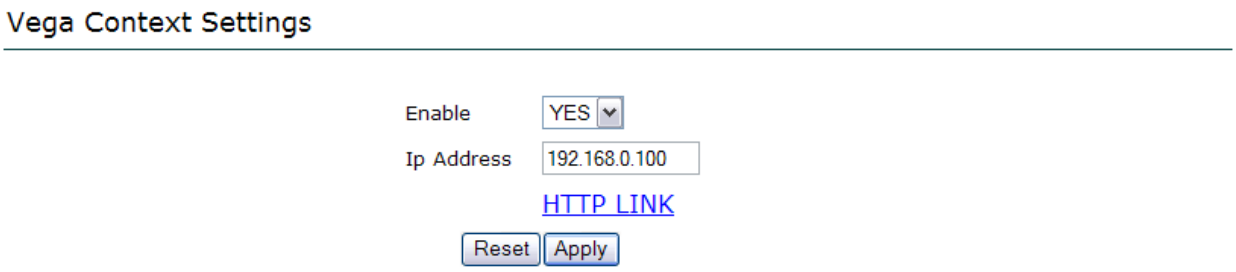
- **Network:** network settings and Time and Date synchro. (by SNTP).
- **HTTP users:** user who can get inside the web server of the camera.
- **Log Files:** Settings regarding log file via FTp
- **Firmware:** Firmware upgrading and backup settings.
- **Device Info:** Info regarding the hardware and the software running over the camera.

VEGA Network Context

Vega Network Context (VNC) is a color video camera with Ethernet network interface and power supply. It can be used together with a VEGA machine to have a context color image of the car plate read, in addition to the black and white image.
VNC management is totally automatic via the software of the associated VEGA machine.
As to configuration, it is necessary to enter in VEGA web interface the VNC IP address. This information is entered in the Vega Context page accessible via the icon below:

Vega Context

In this page, the only required parameter is the VNC IP address.



Like VEGA, VNC has a web interface too. Its main use is allowing live video for mechanical aiming of the machine.

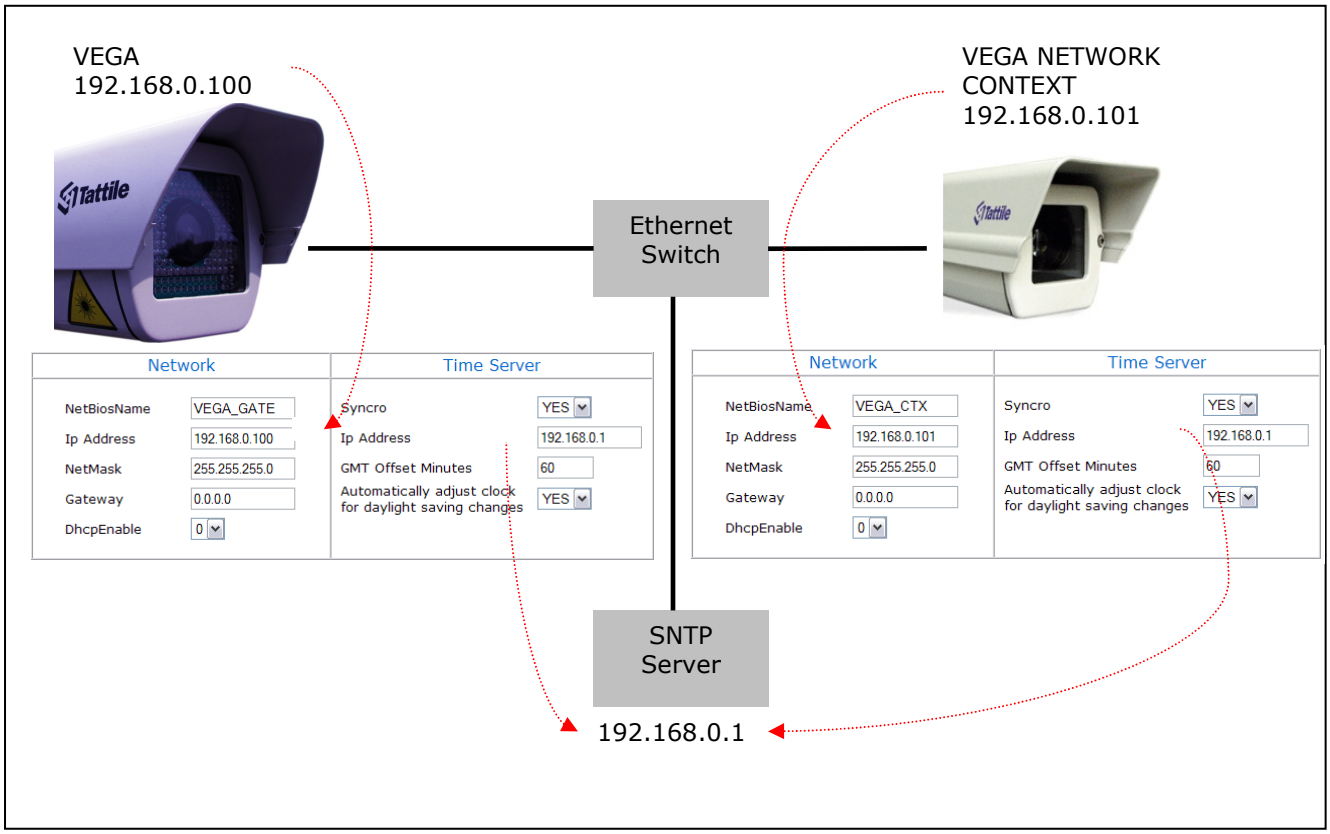
Date and Time Synchronization

For the VNC system to operate properly, it is essential that VEGA and VNC be synchronized to a time server.
There are two synchronization methods:

- VEGA and VNC synchronize to the same (for example, to a PC)
- VEGA serves as time server for the VNC. This is possible if VEGA has a software version equal to or higher than 4.64.

If using the firs method, it is necessary to specify the time server IP address in the Network section of the VEGA and VNC web interface (Time Server -> Ip address)

If using the second method, it is necessary to specify VEGA IP address in the VNC Network section.
The following charts show the two configuration methods:


VEGA
192.168.0.100
VEGA NETWORK
CONTEXT
192.168.0.101
Ethernet
Switch
Network
Time Server
NetBiosName
VEGA_GATE
Ip Address
192.168.0.100
NetMask
255.255.255.0
Gateway
0.0.0.0
DhcpEnable
0
Syncro
YES
Ip Address
192.168.0.1
GMT Offset Minutes
60
Automatically adjust clock
for daylight saving changes
YES
Network
Time Server
NetBiosName
VEGA_CTX
Ip Address
192.168.0.101
NetMask
255.255.255.0
Gateway
0.0.0.0
DhcpEnable
0
Syncro
YES
Ip Address
192.168.0.1
GMT Offset Minutes
60
Automatically adjust clock
for daylight saving changes
YES
SNTP
Server
192.168.0.1

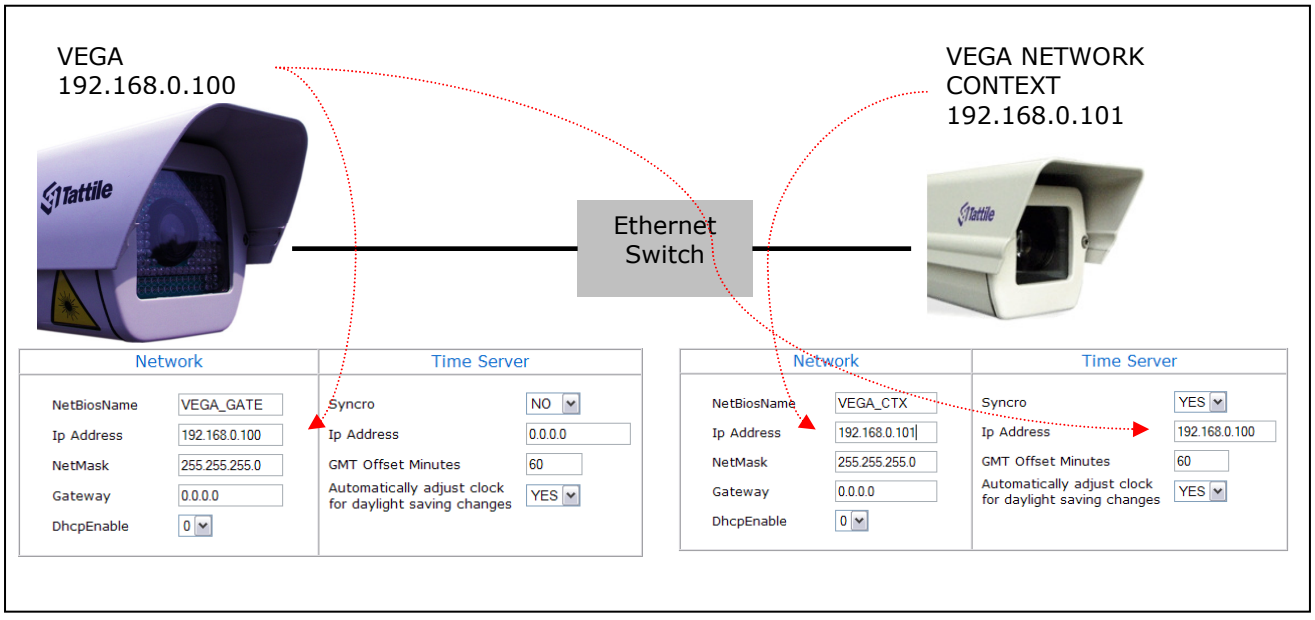

VEGA
192.168.0.100
VEGA NETWORK
CONTEXT
192.168.0.101
Ethernet
Switch
Network
Time Server
NetBiosName
VEGA_GATE
Ip Address
192.168.0.100
NetMask
255.255.255.0
Gateway
0.0.0.0
DhcpEnable
0
Syncro
NO
Ip Address
0.0.0.0
GMT Offset Minutes
60
Automatically adjust clock
for daylight saving changes
YES
Network
Time Server
NetBiosName
VEGA_CTX
Ip Address
192.168.0.101
NetMask
255.255.255.0
Gateway
0.0.0.0
DhcpEnable
0
Syncro
YES
Ip Address
192.168.0.100
GMT Offset Minutes
60
Automatically adjust clock
for daylight saving changes
YES

Image Sending Management

A VEGA machine associated with a VCN operates exactly the same as a system made up with a VEGA machine associated with an embedded color context camera. Therefore VEGA software automatically manages the VNC and sends requests for images.

Web Server

Here below the two main web pages are shown. VNC web interface functions are similar to the standard VEGA functions – for a description, please refer to the relevant paragraphs in this Guide.

In the Camera Context page it is possible to set the maximum exposure time to use for image grabbing. This parameter should be set based on the installation involved: set a higher exposure time to obtain brighter images. Too high an exposure time may produce blurred images because of vehicle speed. When setting this parameter an average value should set that satisfies both requirements.

Examples of System Architectures

Here below, free run and trigger modes are shown, with some examples using Ethernet network as well.