



Advanced Image Processing Products - <http://www.htsol.com>

SeeRoad



Technical Document

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Table of Contents

1. PURPOSE & SCOPE	4
2. REFERENCED DOCUMENTS	4
3. OVERVIEW	5
3.1. Product description	5
3.2. System Configurations	5
3.3. System Architecture	6
3.3.1. Hardware Elements	6
3.3.2. Software Elements	6
3.4. Interfacing with SeeRoad	7
3.4.1. DDE message and Client applications	7
3.4.2. Windows Event logging	7
3.5. Technical Document overview	7
4. MECHANICAL INSTALLATION	8
4.1. Overview	8
4.1.1. Installation Assumptions	8
4.2. SeeRoad Head installation	8
4.2.1. Height of SeeRoadHead	8
4.2.1.1. Typical Heights	8
4.2.2. Distance from Front Plate	9
4.2.3. Dual Camera per lane	10
4.2.4. Rear Capture	10
5. HARDWARE INSTALLATION	11
5.1. SeeRoadHead	11
5.1.1. Camera Wiring	11
5.1.2. Light Safety Notations	11
5.2. Frame Grabber(s)	12
5.3. Optional I/O Card and TBL	13
5.4. Software and Driver installation	13
6. SOFTWARE INSTALLATION	14
6.1. Power up the PC	14
6.2. Frame grabber Driver	14
6.2.1. Installing under Windows 2000	14
6.2.2. Testing the installation	14

6.2.3.	Multiple frame grabbers	15
6.3.	I/O card driver - PCI BUS boards	16
6.3.1.	PCI-1751 Driver Installation	16
6.3.2.	PCI-1751 Device configuration.....	16
6.3.3.	Testing the installed IO card.....	18
6.3.3.1.	Test with driver test program	18
6.3.3.2.	If the tests fail.....	18
6.4.	HASP License-Plug driver.....	18
6.5.	Prepare the SeeRoad directory	19
6.5.1.	SeeRoad Directory.....	19
6.5.2.	ShortCut and Startup	19
6.5.3.	SeeLane Client.....	19
6.6.	Power up the SeeRoadHead	19
7.	SEEROAD SETTING	20
7.1.	Main Display.....	21
7.2.	Operation States	22
7.2.1.	Capturing State (on-line)	22
7.2.2.	Idle State (off-line)	23
7.2.3.	Live Video & Trigger Update	24
7.2.3.1.	Change Video Settings.....	25
7.2.4.	Settings-Change State.....	26
7.2.4.1.	General Settings	26
7.2.4.2.	Camera Setting	27
8.	USING OTHER CAMERAS.....	28
8.1.	MinTron MTV-13V3HC.....	28
8.1.1.	Overview	28
8.1.2.	Setup.....	29
9.	SUPPORT AND MORE INFORMATION.....	30

1. Purpose & Scope

This document provides operational and installation information on SeeRoad, a recognition system for roadside installations. The objective of the SeeRoad system is to perform a single-lane plate recognition using a software trigger. It is based on the image only, detecting the motion within a predefined "hot" detection rectangle.

The system is used to monitor the traffic of vehicles at the side of a road or highway lane, in order to alert on the detection of wanted vehicles (for example, stolen cars) or for other purposes. It could also be used to read license plates from a Video Tape for post analysis.

This system is based on the SeeCar Vehicle License Plate Recognition (LPR) software, which is used as a DLL and is integrated into the system.

The description in this document applies to SeeRoad version 1.4 and higher. *Note that SeeRoad supercedes the former SeeLaneTrigger application which performed the some of the same objectives, with improved functionality and performance.*

2. Referenced Documents

- 2.1 SeeCar DLL - Technical information document
- 2.2 SeeLane - Technical information

These documents are available in our home page, see last section for details.

3. Overview

3.1. Product description

SeeRoad is a sophisticated image processing system that tracks the cars' plates, reads and identifies their numbers. The identified number is displayed on the system display, and can be transferred to other Windows applications (via DDE message). The image file is also saved on disk as a JPG image.

It can be placed at the side of a traffic lane or in any other location that requires automatic identification. Each unit can control a **single** lane. The car detection (triggering) is performed by a software trigger, thus it is optimized for temporary roadblocks that can be quickly installed.

3.2. System Configurations

SeeRoad has only a single-lane configuration, but can be configured with several cameras to one of the following options. (Each configuration is predetermined in the license plug, and preset at the factory).

- Single camera per lane (the default option; for standard lanes)
- Dual camera per lane ("Stereo"; for wider lanes)
- Additional color camera (to take a wide color view)

3.3. System Architecture

SeeRoad is a turnkey system, and is based on the following elements:

3.3.1. Hardware Elements

- a PC Pentium running Windows 2000 or XP, with at least 1G RAM
- **SRH - SeeRoadHead** – a special Camera/Illumination unit (for day & night operation) which is optimized for this application. It has a more powerful illumination and lens than the standard SeeRoadHead. *Additionally, this unit could be a standard PAL camera without illumination. See “Using other cameras” section.*
- **Frame Grabber(s)** - which capture the images from the camera units
- **Optional I/O card** - multiple I/O discrete lines - which supports the illumination control. *The board is optional, and SeeRoad can run without the I/O control.*

3.3.2. Software Elements

- SeeRoad Windows application,
- SeeCar DLL - software package which is used to analyze the images and extract license plate string.

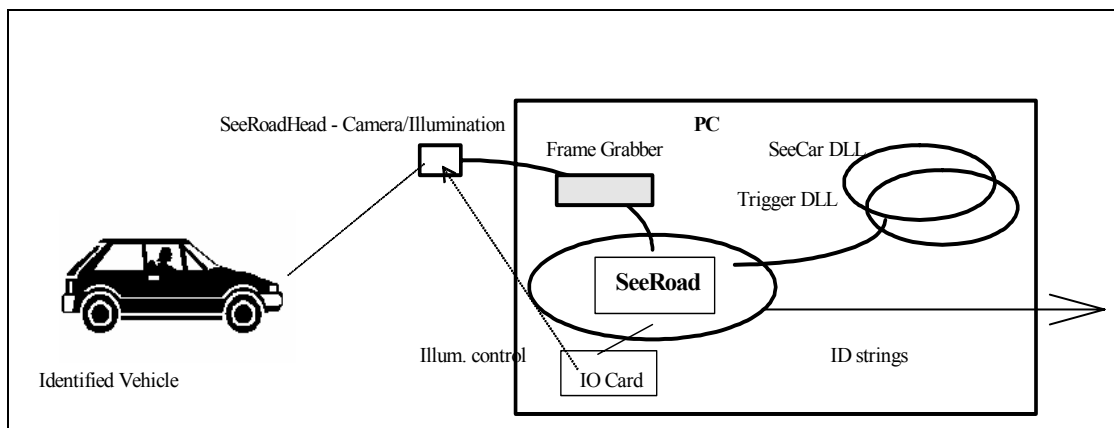


Figure 3.2: SeeRoad Architecture

3.4. Interfacing with SeeRoad

3.4.1.DDE message and Client applications

SeeRoad outputs a DDE message which is compatible to the SeeLane system (see reference #2.2). It contains the recognition results, date and time, and an image file path.

Therefore, it could be interfaced with the following “Client” applications:

- SeeLaneClient (which writes the data to a log file). Its sources are provided with the SDK in VC++ and VB, and is useful as a sample application which can simplify the integration.
- SeeLaneLog (another viewer, useful for off-line review),
- SeeCarTrap (which activates a sound-card “siren” on a stop list),
- any other Client Application which is based on these DDE messages.

3.4.2.Windows Event logging

SeeRoad performs events reporting about most critical operations and its results. *It might be useful to check the Event Viewer. For example,if the program fails to start, examine the application section for more info.*

3.5.Technical Document overview

This document is structured as follows:

Section 4 - describes the physical/mechanical installation

Section 5 - describes the hardware installation (with the PC shut down)

Section 6 - describes the software and driver installation (PC powered up)

Section 7 - details the SeeRoad application operation and setting

Section 8 – describes the use of other camera types.

4. Mechanical Installation

4.1. Overview

This section describes the mechanical/physical installation.

4.1.1. Installation Assumptions

The following lens are assumed:

- 50 mm lens manual-IRIS

This will be referred as "standard lens" installation.

4.2. SeeRoad Head installation

4.2.1. Height of SeeRoadHead

4.2.1.1. Typical Heights

For most installations, install the SeeRoadHead (SRH) on a tripod at a recommended height of 1.1 meters (or within 1m-1.2m).

This height optimizes the performance and positions the camera to look *downwards* in order to minimize the sun effect – since most plates are mounted at a height of 0.20 to 1.25 meters.

4.2.2.Distance from Front Plate

This paragraph refers to installation of the camera in the front of the vehicle.

Install the SRH **as close as possible** to the traffic lane, within 0.5 – 1.5 meters. The smaller the better! *See the illustration above, parameter B.* This can be on both sides of the traffic lane. Do not attempt to recognize from the second lane since the angle of view will be too steep and the car will pass by at a high rate of angular change.

The camera unit should be installed at a certain range from the “line of the detection” of the front of the car (parameter A in the following illustration). The range is determined by the plate size and the lens on the camera, and should not be too far (the illumination will decrease) or too close (the field of view will be too small). The “line of detection” is the position when the software trigger detects the plate.

The following diagram shows this setup.

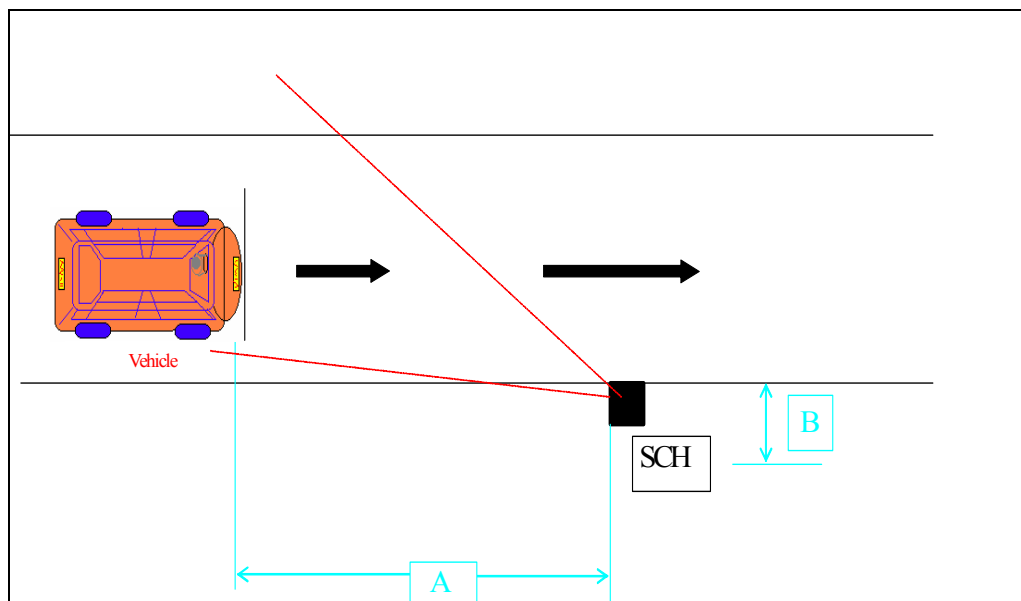


Figure 4.2.2: Front Installation distances (*See text for explanations*)

Typical ranges for parameter A are:

- European (55cm) plates with 50mm lens – 15-17 Meters
- European (55cm) plates with 25mmlens – 8-9Meters
- USA (35cm) plates with 50 mm lens – 12-13 meters

4.2.3. Dual Camera per lane

For **wide** lanes, two cameras may be set to cover the entire lane. The first camera may be set (for example) on the left side, while the second camera covers the right side - with some overlap.

SeeRoad operates in **parallel** and operates the software trigger on each camera **separately**. *Upon trigger, only the triggering camera performs the recognition.*

4.2.4. Rear Capture

SeeRoad can also be installed to capture the rear plates. The installation distance is the same as the front installation, and is shown in the following diagram.

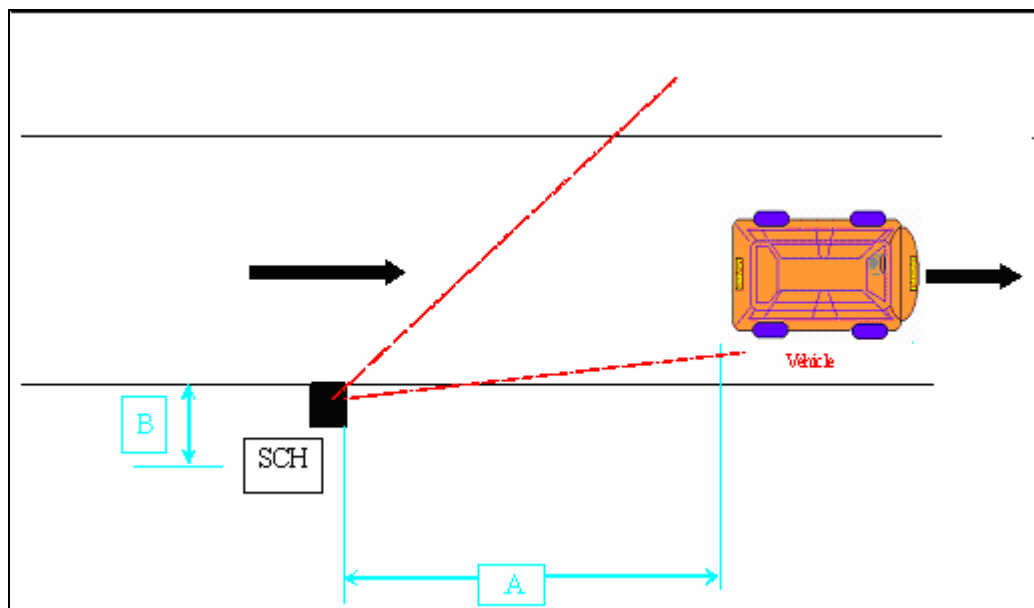


Figure 4.2.4 Rear Installation

In such case a special option should be set to flag the rear-plate logic mode (see SeeRoad settings section). The rear-plate logic will trigger when the trigger stops, which happens when the vehicle exits the trigger zone. This is different than the front trigger, where the recognition will start when the trigger starts.

5. Hardware Installation

This section covers the hardware installation.

Note that all the next steps will be performed with the PC powered off.

5.1. SeeRoadHead

This paragraph assumes that the HTS special integrated camera/illumination unit is used. For other camera models, please refer to the special-cameras section.

5.1.1. Camera Wiring

- A. Connect the wire PWR: red (+) and black (common) wires from SRH to the power supply (PS). Do not plug the PS to mains yet! Make sure that the power supply is located close to the camera (up to 5 meters, recommended 2 meters).

Note that for a car installation, a DC to AC (100-240VAC) converter is required, recommended at 500-1000 Watt according to the PC requirements. Note that each camera average power requirements is about 50Watt.

- B. The other connections (green and white control signals) will be connected in the following steps. *Warning: Avoid connecting these signals to the red power wire, since it will damage the control circuit.*

5.1.2. Light Safety Notations

Note on Compliance with International Standards:

The illumination unit (part of the SeeRoadHead) complies with International Standard IEC 60825-1, for Class 1 LED (light emitting diodes) product containing Class 1 LED's. Class 1 LED product poses **no hazard** to the user or to any other person present near the illumination unit. The use with the illumination unit is totally safe and needs no specific precautions.

5.2. Frame Grabber(s)

The system is based on one to three frame grabbers, according to the number of cameras supported by the system.

There are two types of frame grabbers – BASIC or FULL. The “basic” frame grabber will be used for a single camera, and the “full” may support two cameras in parallel (but they must be both monochrome).

Install each frame grabber as follows:

- A. Insert the frame grabber (FG) into a PCI slot. *Don't power up the PC yet.*
- B. Connect the coaxial cable from SRH to the FG (a BNC plug).
- C. Use the supplied SMB to BNC adapter cable to connect to the camera's video cable: connect SMB side to first channel of each frame grabber (near the LED). In case of a FULL RIO frame grabber, connect the two cameras to channels 1 & 2.

Note that the SMB connector and wire is delicate - please handle it with care.

- D. Try to minimize the distance from the cameras to the frame grabber (and PC) as much as possible. Recommended distances to all the SRH is about 4-5meters (as our supplied cable) up to 30-40meters. *In case of the longer ranges, it is advised to have the power supply close to the SRH unit rather than supplying its power over the long lines.*
- E. Some PC motherboards may have conflicts with the frame grabber. A list of recommended motherboards is available in the on-line support page.

5.3. Optional I/O Card and TBL

SeeRoad can run without an IO card, but in this case the Illumination will be hard-wired rather than controlled by the application. *Please consult with us on this issue.*

We currently supply only one set of I/O cards and TBL terminal blocks.

The set consists of the I/O board (PCI-1751), flat cable of 68 pins, TBL-6822 terminal block (TBL) with a series of screws and LEDs, and a cover box.

- A. Do not change the factory settings on the PCI board.
- B. Install the I/O card in one of the free **PCI bus** slots in the computer.
- C. Connect the flat SCSI-68 cable to the I/O card. On the other end connect the TBL 6822 terminal block (which has a connector for the cable).
- D. Connect the SeeRoadHead (SRH) wires as follows (for the first camera; other cameras are wired at higher contacts in pairs):
 - *white* wire LSB from SRH to contact no.9 on the TBL, and
 - *green* wire MSB from SRH to contact no.10 on the TBL
- E. Note that when the PC is powered up and the SeeRoad application is **running** (this will be done after completing the software installation), the default state of the TBL will be:
 - all active inputs and outputs LEDs are off,
 - power-on led is on

5.4. Software and Driver installation

Now the software installation steps will be required in order to complete the installation, as described in the next section.

6. Software installation

This section covers the software and drivers installation. It assumes that the hardware units were already inserted into the computer slots (as covered by the previous section) and the PC is yet shut down.

Note: The software installation is automated in some Country Releases by an automatic installation program. The text below assumes that the installation program is not yet released for your country and a manual installation is required.

6.1. Power up the PC

Power up the PC.

Wait until the Windows operating system boots up. It will notify that a new card has been detected.

6.2. Frame grabber Driver

The following text assumes the 6-lane RIO frame grabber.

Following the Windows driver request, install the frame grabber driver that is supplied within the frame grabber package, or on the release CD.

6.2.1. Installing under Windows 2000

- Make sure you are logged on to Windows 2000 with administrative privileges.
- Insert the first Rio installation disk into the floppy disk drive or the Rio CD-ROM into the CD-ROM drive.
- Run Setup.exe from the first Rio installation floppy disk or the Rio CD-ROM.
- Follow the instructions on the screen.

6.2.2. Testing the installation

After installation on Windows 2000, the Rio Frame Grabber can be used with the RioWin windows application, to start grabbing.

Alternatively, running the SeeRoad application as described later could also perform this test.

6.2.3. Multiple frame grabbers

If more than one frame grabber is installed (for parallel capturing by a second camera, or for color image capturing) – you will need to change the frame grabber number to start from 1.

Use the Start/Settings/Control-Panel RIO Driver settings to define the board ID to a unique number (to 1 for first board, 2 for second board,...).

6.3.I/O card driver - PCI BUS boards

This is optional – in case an IO card is installed for illumination control.

The PCI-1751 I/O card is a plug & play board and is easy to install.

6.3.1.PCI-1751 Driver Installation

Place the I/O card CD in your CD-ROM Device, then its setup application will automatically activate. Now click the **drivers** option, then click your **operating system** option, then follow the setup instructions.

After this installation you need to run the device installation under the Windows operating system, as follows.

6.3.2. PCI-1751 Device configuration

- A. Select the device installation using the following Windows options:
start -> programs -> Advantech Drivers -> Device installation.

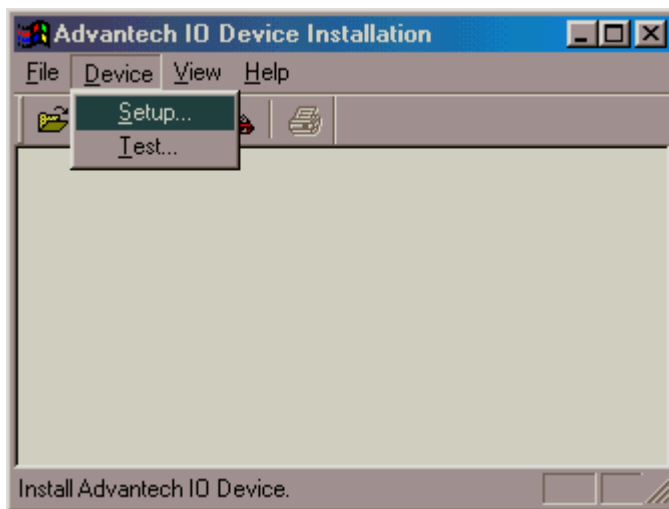


Figure 7.4: device installation main screen

- B. Click **Setup** in the menu.
C. A list of installed devices will appear (will be empty at this stage)
D. Click **add** and you will get a list of devices in the lower side:

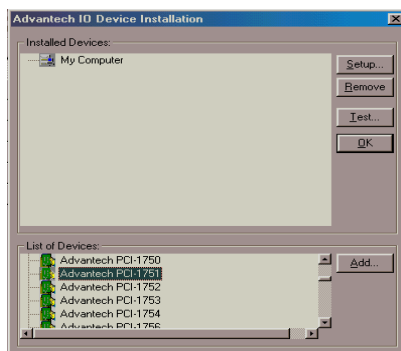


Figure 7.5: device installation - PCI-1751 selected

- E. Choose Advantech PCI-1751 *as above*.
- F. Now click **install**.
- G. The new device card setup dialog will now appear - with the base address selected automatically by the setup program.
- H. Please set the following:

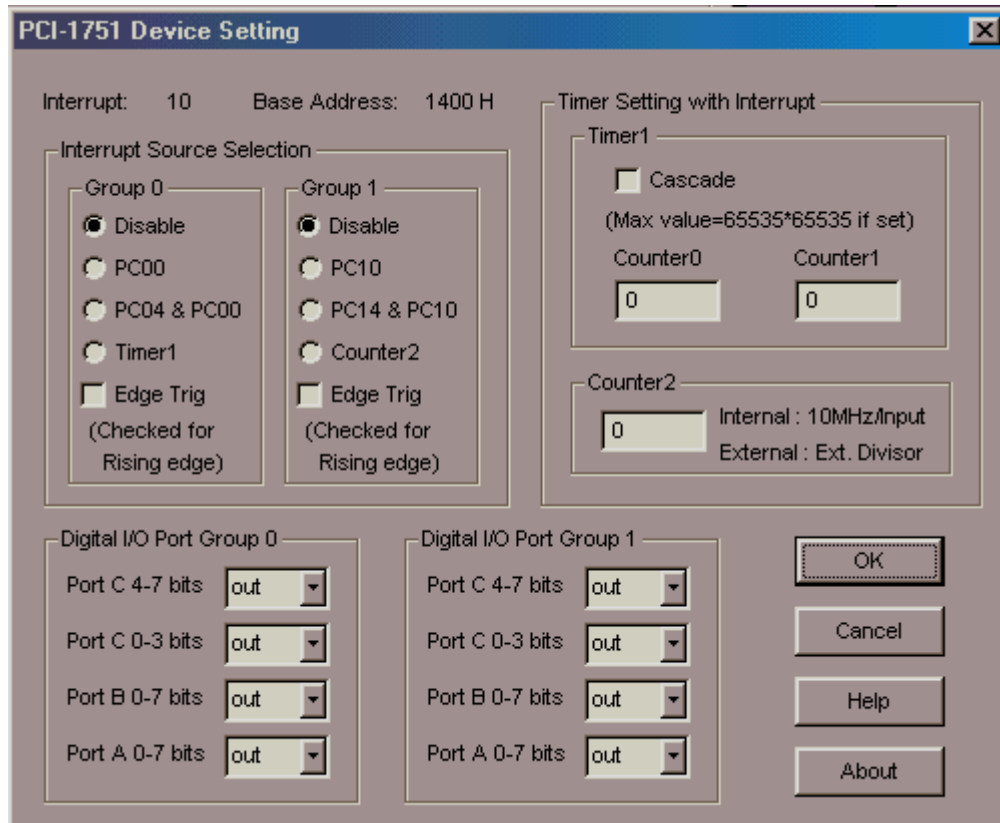


Figure 7.6: Card setup

- I. Hit OK to exit this window and exit the device installation program.
- J. The I/O card device is ready for use.

6.3.3. Testing the installed IO card

6.3.3.1. Test with driver test program

A test program is provided with the installed device driver: the device **self test**. Select the device self test using the following Windows options:

start -> programs -> Advantech Drivers -> Device Test

This self test allows you to set each output and see its affect on the TBL leds. It also allows to test the state of the input (high or low for each input). Use this test to verify the proper installation of the I/O card.

6.3.3.2. If the tests fail

If this fails, uninstall and re-install the drivers and device.

6.4. HASP License-Plug driver

The license plug (HASP) dongle requires an additional installation. Install its driver that is included in the \driver\Hasp directory: run the hdd32.exe installation application.

Additionally, insert the dongle to the printer (parallel) port.

Note that a USB plug is also available if required.

SeeRoad needs a special license to execute. Verify that the lable on the plug indicates “SeeRoad” and the proper number of cameras configured to run with it.

6.5.Prepare the SeeRoad directory

6.5.1.SeeRoad Directory

Make a SeeRoad directory in your hard disk. Copy the SeeRoad release directory files to your disk.

Note: If you have a different frame grabber than the default RIO 6-lane frame grabber, copy the suitable SeeRoad.exe from the child directory according to the appropriate frame grabber (such as VFW).

6.5.2.ShortCut and Startup

Create a shortcut icon on the Windows desktop for convenience. You can also add the SeeRoad to the startup menu.

6.5.3.SeeLane Client

You can also copy the SeeLaneClient application to the same directory. The Client application intercepts the DDE messages and saves them onto a log file.

You can also make your own application to intercept the messages.

6.6.Power up the SeeRoadHead

- A. Connect the PS to mains (110-240 VAC).
- B. Check that the camera is functioning by running the live video tests using either the Windows application that is supplied with the frame grabber driver (RIO Win), or (better) with the SeeRoad application.

7. SeeRoad setting

This section describes how to set the SeeRoad application for best results. It assumes that all software, hardware and drivers are already installed - as covered by the previous sections.

The following pages contain descriptions of the various settings and operation states and modes. Most of the screen are for the maximum configuration of 3 cameras.

Upon the first execution the SeeRoad might not run. In this case - examine the Windows Event application log with the Windows Event viewer. When it runs, a message box will appear "Please enter settings and verify video Settings". The application is shipped with a default setting, which fits most of the installations, but it requires a review in the first time it is executed. *For more information on these settings, please refer to the information in the following sections.*

7.1.Main Display

After activating the SeeRoad application, its main display will appear.

The following illustration shows a typical display, which consists of the following display elements:

- Main image display (in the center) – shows the last capture and recognition result as title. In the capture history mode it will display the selected event.
- Events history (on the right table) – shows the history of the recognitions. In Idle mode a certain event can be selected and displayed.
- Trigger status (on the bottom) – the live status of the trigger (state switch from ON to OFF)
- Operation mode status (on the bottom right corner)
- Uptime (on the bottom right corner)
- Options and option icons (on top side)
- Camera display tabs (on top side of display)

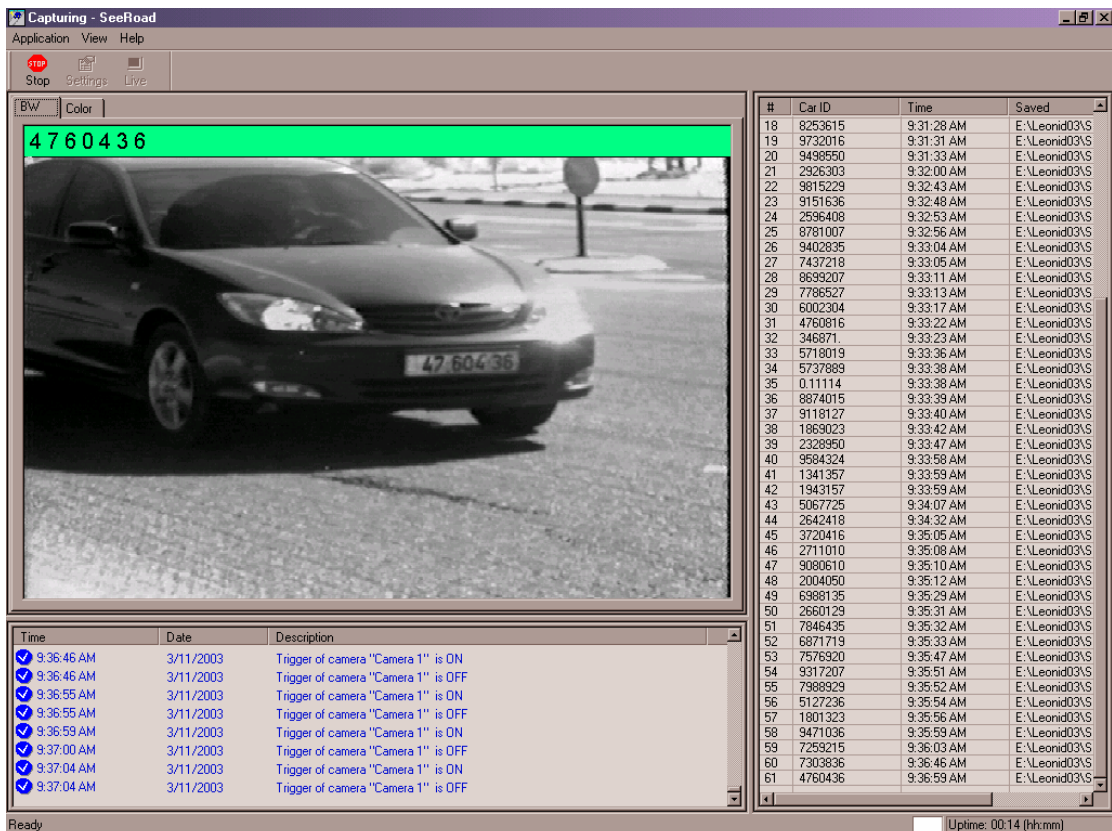


Figure 7.1: Main SeeRoad Display (in capturing on-line state)

7.2.Operation States

The application operates in the following states:

1. **Capturing state (online)** – the system runs, checks for trigger condition, and recognizes the car plates after each trigger
2. **Offline states**
 - **Idle state** – the system is not capturing, and can be used to display old events (by double-clicking on a line in the history list)
 - **Live Video state** – displays the live video from the camera, and can optionally change the trigger size and location
 - **Settings change state** – system parameters and configuration can be changed.

The status display indicates the current state by flashing black/white (“capturing” online state) or a steady green (offline states).

These states are detailed in the following pages.

7.2.1.Capturing State (on-line)

The previous figure (7.1) shows a sample display for this state. Passing cars are detected by the Software trigger, and when this occurs the system performs recognition and outputs the result to the display and to the events history (at right). The bottom display also shows the current status of the trigger.

The operator may start or stop the capturing using the menu options of the start/stop icons or (F2) button.

In case the trigger is not set correctly (for example, triggering when there is no car, or not triggering when a car passes), it could be updated (see below – updating the trigger in live mode). The system also automatically updates the trigger to accommodate for this case (although it may take a few minutes) and to accommodate the change of environment light (switch from day to night for example).

7.2.2. Idle State (off-line)

This state is when no capturing is performed, and may be used to switch to other states or to display old events.

To view previous events in the Idle state, simply double-click on the desired event on the right list. The display will show that event's image and the recognition results.

The following figure shows an example.

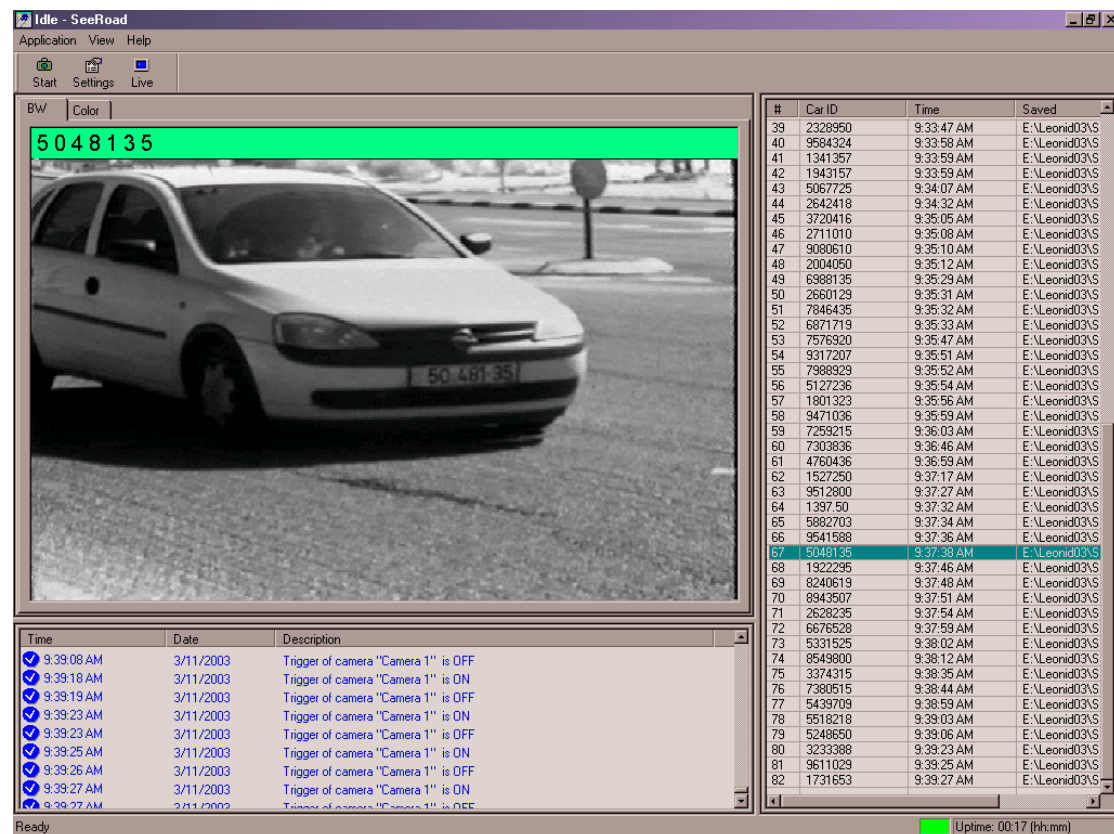


Figure 7.2.2: "Old" Events history display (double click and see)

7.2.3. Live Video & Trigger Update

You can view the camera output using the SeeRoad's built-in **live mode**. In this state the main display will show the live video of the selected camera (the tabs on top of the display select one of the enabled cameras).

The trigger zone (a red rectangle) is displayed. When a car passes the zone and is detected, the title "Trigger" will appear in the center of the triggering zone. *Note that the color camera is an exception and will not show the trigger zone.*

To update the trigger zone, select the top-left corner with the cursor and drag it right wise and downwards - with the left mouse button kept pressed. When the desired size is achieved, stop pressing the button. To make this new rectangle the desired detection zone, select the "Trigger Zone" Update option. The application will then "learn" the content of the zone and adapt to it. Then new cars will be detected with the new zone and you should check the operation with a dozen or so cars.

To resume the old ("current") zone, you may select "Show Current" option. *This is possible only if the "Update" was not pressed before.*

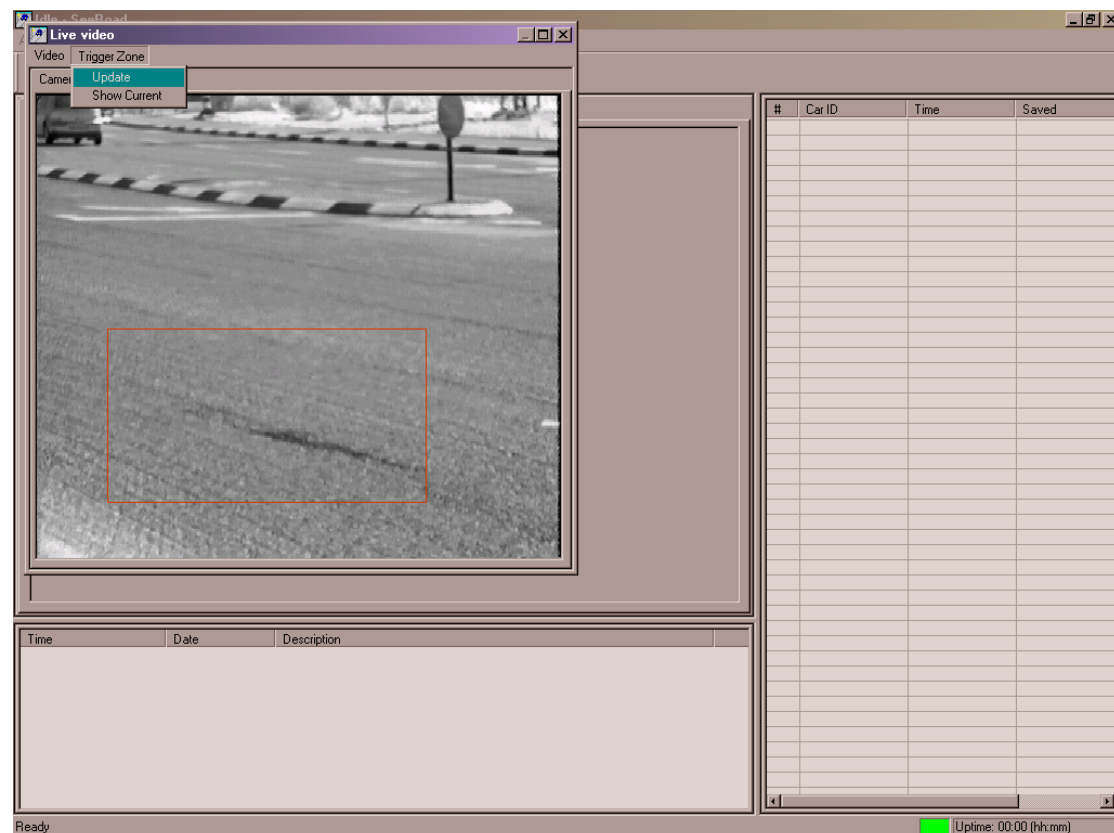
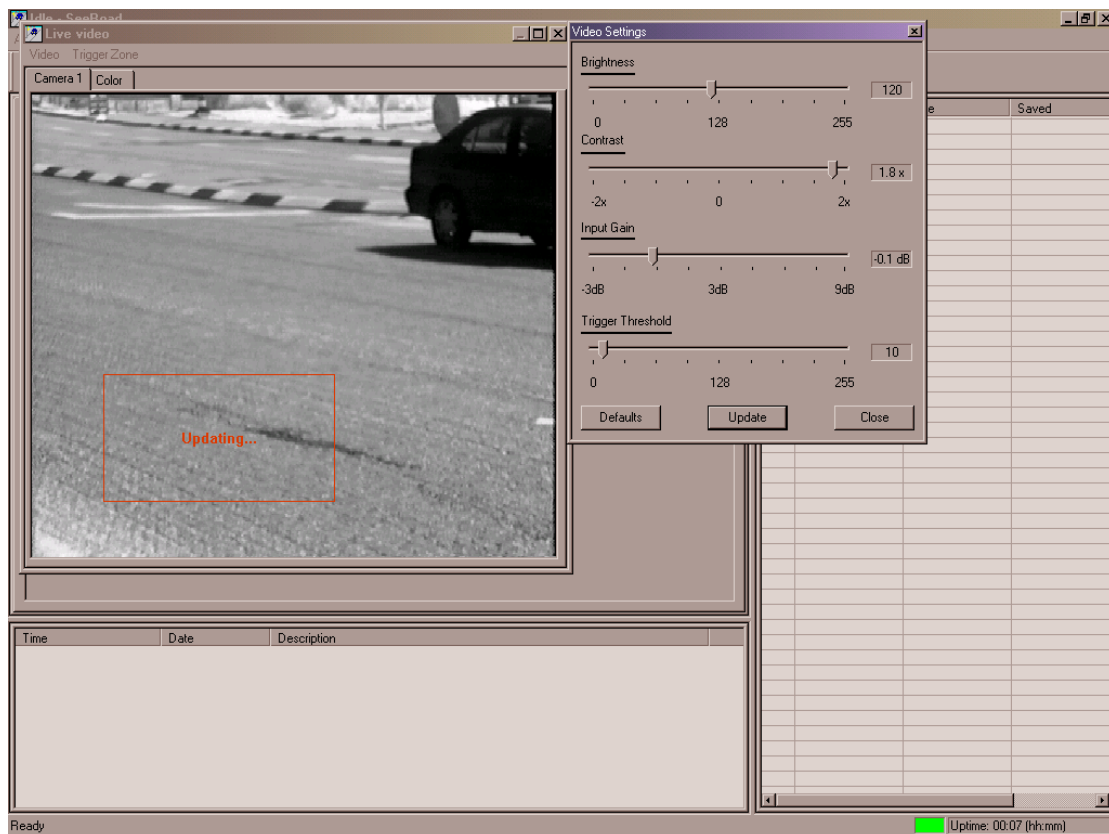


Figure 7.2.3: Live video and Trigger update

7.2.3.1. Change Video Settings

You can optionally change the following frame grabber and algorithm video settings:

- brightness and contrast (best values are 80 and x1.3),
- input-gain (usually, don't change this),
- trigger threshold (10 is default and recommended; lower is more sensitive; higher is less sensitive).



After the change, press on “Update” in order to update the detection zone trigger.

7.2.4.Settings-Change State

SeeRoad is set to a default settings. You will probably need to update these settings.

7.2.4.1.General Settings

The following parameters may be changed:

- Images directory (will save the images as daily subdirectories at that path). It is advised to use short paths (such as c:\images).

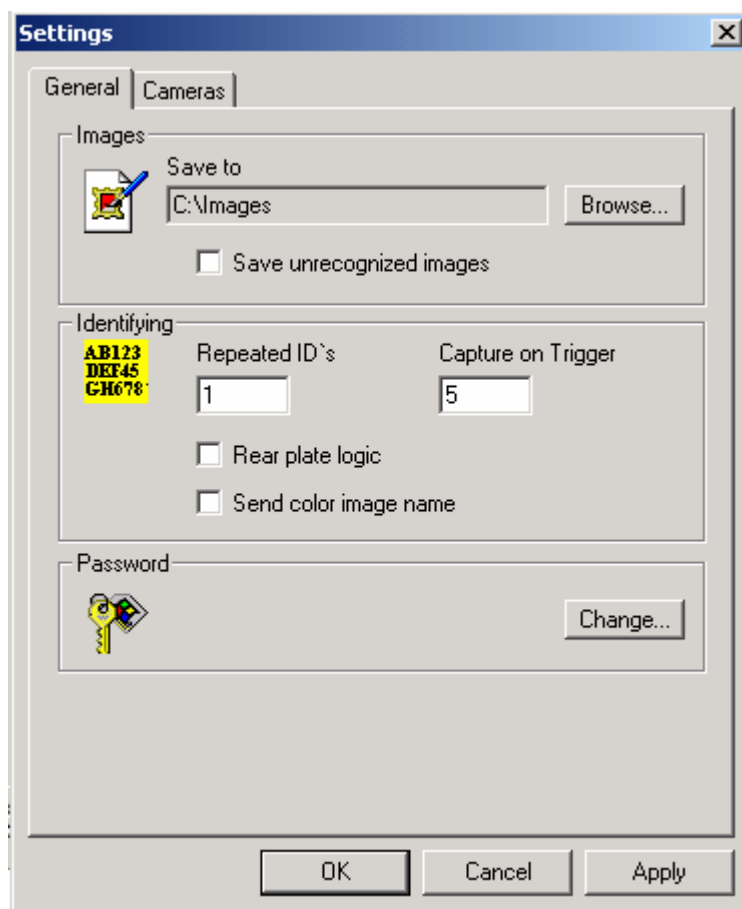


Figure 7.2.4.1: Changing the General settings

- Identification parameters –
 - Repeated IDs set how many same recognitions should be seen in order to output the result (2 is best for less noisy outputs; 1 is best for fast traffic).
 - Capture on Trigger – the number of images captured at the trigger (optimum is 3; depends on the traffic speed and the CPU power)
 - Rear plate logic – mark this option in case the camera is looking at the rear plate.

- Send color image name – in case of a color camera configuration, the result message will include the color image name rather than the monochrome recognition camera name.
- Password – optionally protect the settings by inserting a password.

7.2.4.2. Camera Setting

The following parameters may be changed for **each** camera:

- Enabled – is the camera enabled (default) or not. If enabled - the title at the right will show the type of video signal and its status. *The title is updated after pressing the Apply button, or upon entry.*
- Frame grabber (number) – The ID of the frame grabber.
- Illumination LSB pin – the TBL output connection of the first (lsb-white) wire. The MSB will be the next output pin. *These settings are disabled in case of no IO card installation.*

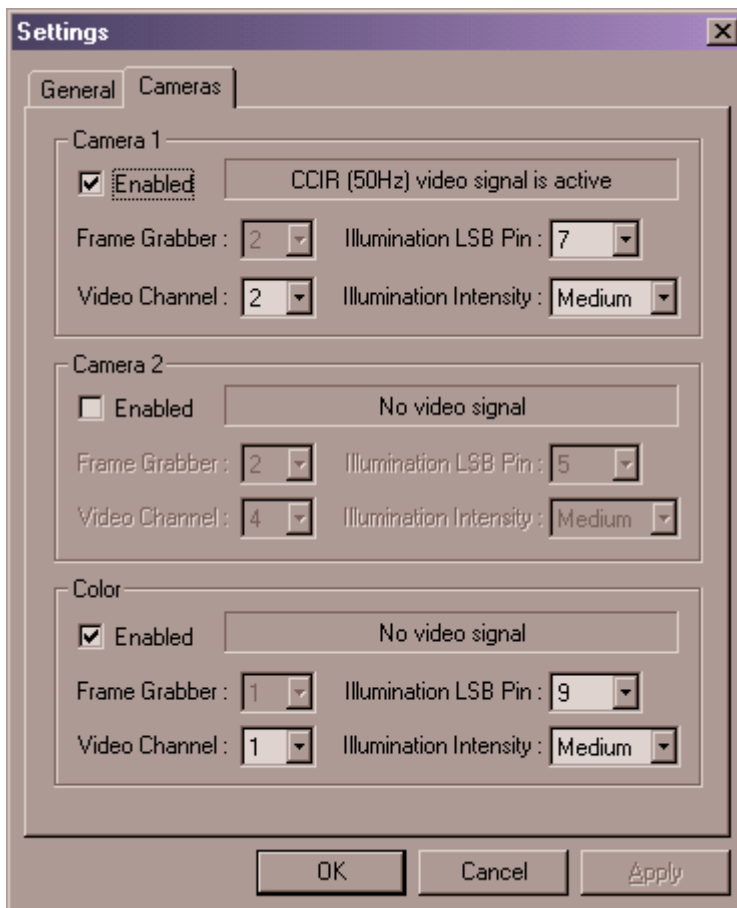


Figure 7.2.4.2: Camera settings

8. Using other cameras

This section describes possible configurations of SeeRoad with other types of cameras.

8.1. MinTron MTV-13V3HC

8.1.1. Overview

SeeRoad can be shipped with Mintron camera model MTV-13V3HC. This camera is a high resolution 1/3" black & white CCD camera which can be used in cases of non-reflective plates or other special cases. The camera is shipped in a special weatherproof enclosure (which its model and specifications may change from time to time).

Additional external illumination, either pulsed solid-state or permanent illumination installed at the site, may be used to cover both day and night operation.



The camera is equipped with lens (usually a DC drive mode). The lens are normally vari-focal lens up to 50 mm, and can be manually set to the proper zoom.

8.1.2.Setup

The camera settings are changed manually by a setup menu, using the switches at the rear of the camera. The menu is displayed on the camera video output, which can be seen in the SeeRoad live display or by using an external video monitor.

A recommended setting of the camera is listed below.

- Title – off
- Sensitivity – off
- ALC/ELC – ALC (auto Iris)
In the ALC submenu set:
 - shutter = 1000
 - iris level = set to desired level if the lens is dc controlled
- BLC – Off (back-light operation)
- AGC – OFF
- W/B – AWC (white balance)
- SYNC – INT (internal)
- OPTION SET – verify that gamma is set to 0.45
- ZOOM – OFF
- M/D – OFF (no motion detection)

9.Support and more Information

You can contact us for more information and assistance at:

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