

**T-SERIES SYSTEM
FOR FIXED RED LIGHT &
SPEED ENFORCEMENT**





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FUNCTIONALITIES

The T-Series Fixed is intended to be installed at the side of the road. It provides enforcement functions for red light and speed violations, as well as supporting functions for collecting data of passing traffic.

RED LIGHT VIOLATIONS

When the system determines a red light violation, it takes two images by default. One (high resolution) image will be captured when the rear of the vehicle is at the trigger line. In general the trigger line is chosen at the same position as the stop bar.

This second (low resolution) image will be captured when the front of the offending vehicle is at the trigger line. Having two images proves that the driver actually passed the stop bar during red light and did not stop at the stop bar.

Optionally software can be ordered to capture an extra (high or low resolution) image. This extra image will be taken after a set interval time or distance and can be used as a speed verification measurement.

Red light enforcement is possible for a maximum of 4 lanes.

SPEED VIOLATIONS

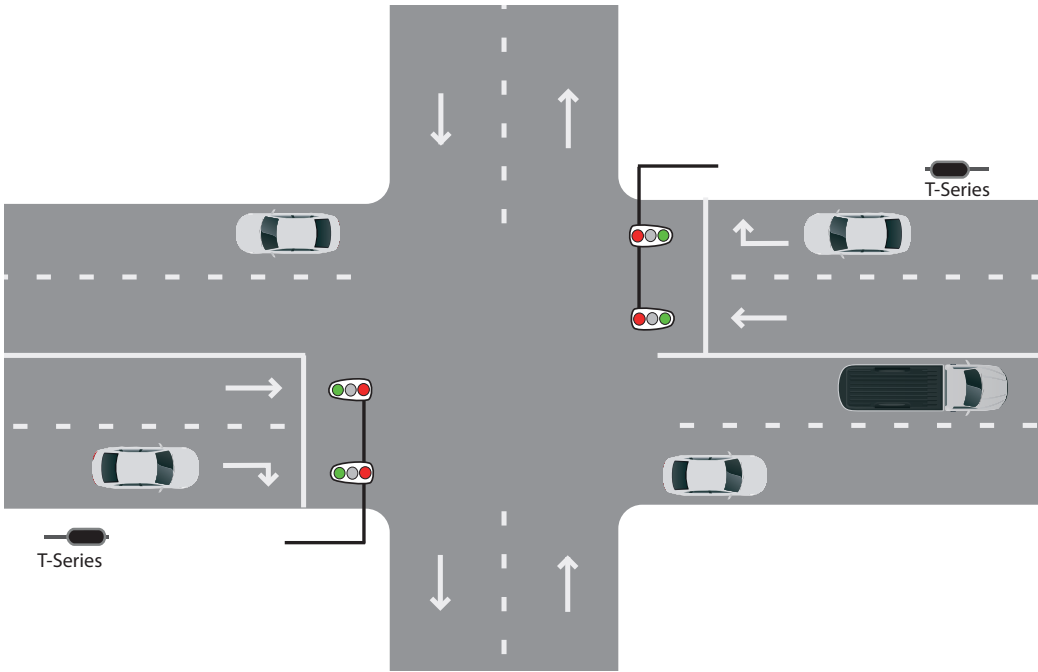
When a speed violation is determined one (high resolution) image will be taken when the rear of the vehicle is at the trigger line.

Optionally software can be ordered to capture a second (high or low resolution) image. This second image will be taken after a set interval time or distance and can be used as a speed verification measurement.

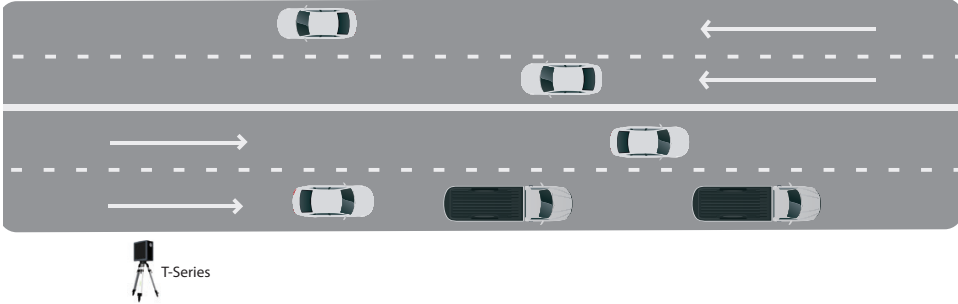
Speed enforcement is possible for a maximum of 6 lanes (including lane divider).

STATISTICS

Apart from separate evidence files, the system provides the user with statistics on all passing vehicles.



Example red light set-up



Example speed set-up



T-SERIES SYSTEM OVERVIEW

The T-Series Fixed system hardware consists of the System box and the Auxiliary box that are both housed in the T-Series Cabinet. The system is connected via direct cable or an optional WiFi connection and is accessible through the Web Based Interface (WBI).



T-Series System Box

SYSTEM BOX

The System box forms the heart of the system and contains all the essential modules for speed enforcement. These modules are described in the sections hereafter. At the rear of the box are the power, I/O and network connector.

The System box has a physical shutdown button with an integrated, two-color LED indicator. The shut-down button indicates the system status and can be used to shut down the system. (See Appendix I-1 Power On/Of).

RT4 RADAR

The RT4 tracking radar continuously measures speed and position of all vehicles in the detection area, providing the system with the data required to determine speed and red light violations.

The RT4 collects information on (radial) speed, (radial) distance and angle 32 times per second. These measurements are combined to track a vehicle. Based on these tracks the speed and position of the vehicles are determined.

GT20 CAMERA

The GT20 camera captures images and event video's under all ambient light conditions. The images are compressed to JPEG2000 format to reduce file size.

SOLID STATE DRIVE

The system is equipped with an internal SSD (Solid State Drive) for storing registration data, system configuration data, logging and video archive.

FT3 IR FLASH

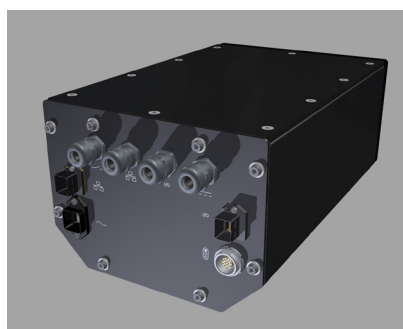
The T-Series holds an IR LED flash panel (FT3 strobe) to provide illumination for the still images and (optional) video frames. Optionally an external white/IR flash can be connected to the system.

POWER SUPPLY

The System box contains a DC power supply by which the externally applied DC voltage is converted into a stable voltage supply for the various system components.

AUXILIARY BOX

The Auxiliary box holds the WTLI (Wired Traffic Light Interface), the AC power supply and the optional FT1 white flash.



Auxillary Box

WIRED TRAFFIC LIGHT INTERFACE (WTLI)

The WTLI measures the current status of the connected traffic lights via a wired connection to the traffic control system. This information is sent to the System box.

AC POWER SUPPLY

The power supply converts AC power to a stable 12V DC voltage to feed the components in the Auxiliary box and the System box. The system starts as soon as the power cord is connected from the Auxiliary box and the AC power is present.

FT1 FLASH (OPTIONAL)

The optional FT1 flash offers additional exposure of the images. The FT1 flash supports high quality images and good recognizability of the violator and the surroundings.

ENFORCEMENT

GENERAL ENFORCEMENT SETTINGS

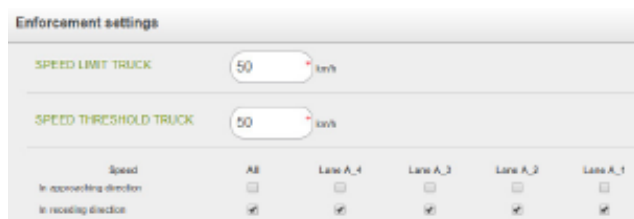
Enforcement systems can be configured straight after confirmation of the alignment procedure or at a later time by using the button Enforcement settings on the dashboard. Select the Edit button to configure Enforcement settings. Make sure that enforcement settings are made conform local laws and regulations.

SPEED ENFORCEMENT SETTINGS

The T-Series Fixed can distinguish cars from trucks. Cars and trucks can have different speed limits and speed threshold settings. Speed enforcement and measurement direction can be switched on or off per lane. Use the utmost left check box to make a selection for all lanes

The legal speed limits (sign speed) can be set between 20 - 130 km/h.
The threshold speed can be set between 20 and 250 km/h.

When a speed violation is determined an image will be taken when the rear or the front of the vehicle is at the trigger line. Optionally a second image can be taken. This second image will be taken after a set interval time or distance and can be used as a speed verification measurement.



Enforcement settings					
SPEED LIMIT TRUCK	50 km/h				
SPEED THRESHOLD TRUCK	50 km/h				
Speed	All	Lane A_4	Lane A_3	Lane A_2	Lane A_1
In approaching direction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In receding direction	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Speed enforcement settings

SPEED VIOLATIONS CRITERIA

The T-Series captures a speed violation when the below criteria are met:

- The system is in enforcement state.
 - The lane where the violation takes place is set for speed enforcement.
 - The vehicle detection corresponds with the measurement direction setting of the lane where the vehicle is detected.
 - The measured speed at the trigger line is equal to or higher than the speed threshold.
-

RED LIGHT ENFORCEMENT SETTINGS

Red light enforcement is available for receding traffic only. Red light enforcement can be switched On or Off per lane. Use the utmost left check box to enforce all lanes.

The red light threshold is the minimum required speed for vehicles when passing the red light. 20 km/h is advised.



The threshold speed setting avoids unwanted triggering caused by slow driving vehicles (during a traffic jam) or caused by vehicles that stop for red light but accidentally cross the trigger line.

The red light grace time is the minimum time that the red light must be lit before a red light violation is registered. Setting between 0.01 and 9.99s.

The screenshot shows a configuration interface for red light enforcement. It features three input fields: 'RED LIGHT THRESHOLD' set to 20 km/h, 'RED LIGHT GRACE TIME' set to 0.50 seconds, and 'MINIMUM YELLOW TIME' set to 2.00 seconds. Below these fields is a section for 'Red light in receding direction' with five checkboxes labeled 'All', 'Lane A_4', 'Lane A_3', 'Lane A_2', and 'Lane A_1'. All checkboxes are currently unchecked.

Red light enforcement settings

The minimum yellow time setting is the time that the yellow light must have been lit before a red light violation is registered. Setting between 0.01 and 9.99



The enforcement type red light can only be configured in case the traffic light interface is active. When the traffic light interface is disabled only enforcement type speed will be available.

When a red light violation is determined two images will be taken and added to the evidence file.

RED LIGHT VIOLATIONS CRITERIA

The T-Series captures a red light violation when the below criteria are met:

- The system is in enforcement state.
- The lane where the violation takes place is set to red light or red light and speed enforcement.
- The red light is lit when the vehicle is within the detection area.
- The grace time has expired.
- The minimum yellow time was reached or exceeded.
- The measured speed at the trigger line is equal to or higher than the red threshold speed.
- The measurement direction is receding.



If it is legally required to have visual evidence that the red light was lit during the violation, users should be aware that the camera must be able to see the traffic lights.

R+S (RED LIGHT AND SPEED) VIOLATIONS

The system captures a red light and speed violation when all the criteria for a red light violation and all the criteria for a speed violation are met. This situation creates a single violation file which shows that there has been a red light and speed (R+S) violation.

STOP AND START ENFORCEMENT

Once the system is fully configured and all components are operational, the system goes to state Ready. The user can now set the system to enforcement by clicking on [Start Enforcement] on the dashboard in the main menu of the WBI.

To end the enforcement session the user can click [Stop Enforcement].

IMAGE DATABAR RED LIGHT

Each image contains a data bar with actual and relevant evidence information. The displayed data fields on the databar can differ, depending on the T-Series configuration. The data bar of a still image only displays the data of the lane where the violation occurred. The default databar is divided in four sections. Below is an explanation of each section.

EVENT SUMMARY	
DATE:	dd-mm-yyyy
TIME:	hh:mm:ss
EVENT NUMBER:	registration sequence number
EVIDENCE TYPE:	Passage, Instant Test Image, Self Test or Triggered Test
MEASUREMENT DETAILS	
LANE:	lane label
SPEED:	measured speed in km/h
RED LIT:	elapsed red light time
YELLOW LIT:	elapsed yellow light time
VIOLATION:	type: Red, Speed, or R+S
DIRECTION:	traffic direction approaching or receding
TYPE:	vehicle type: Car or Truck
IMAGE NUMBER:	image number (1 or 2)
INTERVAL:	This field only shows on the 2nd image and shows the elapsed time between the 1st and 2nd images
ENFORCEMENT	
SPEED LIMIT (CAR):	speed limit for cars in km/h
SPEED LIMIT (TRUCK)	speed limit for trucks in km/h
RED GRACE:	grace time period that must have elapsed before red light enforcement starts.
LOCATION/EQUIPMENT	
INSTALLER:	name of the person or body that has performed the alignment
LOCATION:	location description
SERIAL NUMBER:	camera serial number
APPROVAL NUMBER: (OPTIONAL)	legal equipment approval number

Event summary	Measurement details	Enforcement	Location/Equipment	GATSO
Date: 09-05-2016	Lane: 8	Violation: Red	SpeedLim car: 50 km/h	Installer: Ales1
Time: 13:40:14	Speed: 40 km/h	Direction: Receding	SpeedLim truck: 50 km/h	Location: Gats0123
EventNr: 21	Red lit: 11.3 s	Type: Car	RedGrace: 0.50 s	SerialNr: 14-26-003-173
EvidenceType: ..	Passage Yellow lit: 0.3 s	ImageNr: 1		

Still image databar: Red light violation; image 1

IMAGE DATABAR SPEED

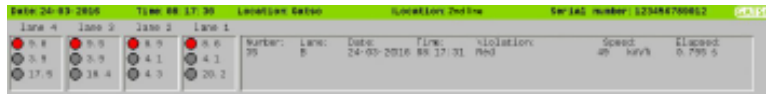
EVENT SUMMARY	
DATE:	dd-mm-yyyy
TIME:	hh:mm:ss
EVENTNR:	registration sequence number
EVIDENCE TYPE:	Passage, Instant Test Image, Self Test or Triggered Test
MEASUREMENT DETAILS	
LANE:	lane label
SPEED:	measured speed in km/h
RED LIT:	elapsed red light time
YELLOW LIT:	elapsed yellow light time
VIOLATION:	type: Red, Speed, or R+S
DIRECTION:	traffic direction approaching or receding
TYPE:	vehicle type: Car or Truck
IMAGE NUMBER:	image number (1 or 2)
INTERVAL:	This field only shows on the 2nd image and shows the elapsed time between the 1st and 2nd images
ENFORCEMENT	
SPEED LIMIT (CAR):	speed limit for cars in km/h
SPEED LIMIT (TRUCK)	speed limit for trucks in km/h
RED GRACE:	grace time period that must have elapsed before red light enforcement starts.
LOCATION/EQUIPMENT	
INSTALLER:	name of the person or body that has performed the alignment
LOCATION:	location description
SERIAL NUMBER:	camera serial number
APPROVAL NUMBER: (OPTIONAL)	legal equipment approval number

Event summary	Measurement details	Enforcement	Location/Equipment	GATSO
Date: 09-05-2016	Lane: 8	Violation: Speed	SpeedLim car: 50 km/h	Installer: Alesi
Time: 13:50:14	Speed: 70 km/h	Direction: Receding	SpeedLim truck: 50 km/h	Location: Gato123
EventNr: 22	Type: Car		SerialNr: 123456789012	
EvidenceType: Passage	ImageNr: 1		ApprovalNr: ABCDE-FGHIJ-KLMN	

Still image databar: Speed violation

VIDEO DATABAR

The fields event number, lane name, date, time, evidence type and speed are repeated in the video frames. The traffic light times are displayed per lane. Concurrent violations are displayed on the video databar (with a maximum of 4 lines). The highlighted line indicates the vehicle passing the trigger line.



Video databar speed violation (no Traffic Light Interface)

Elapsed: this value will only be presented on a video frame databar. It is the time between the trigger-time (the time of the violation) and the time of the frame.

TECHNICAL SPECIFICATIONS

GENERAL

Power supply 110 VAC / 230 VAC
 Nominal power 70 W

Environmental

Cold start -10°C
 Operating temperature -25°C to +50°C
 In storage -40°C to +85°C

T-SERIES

Total Installed Weight 41kg
 Individual Modules <15 kg
 Measurements Pole Cabinet 675 x 560 x 275 cm
 Outer Shell 1.5mm stainless steal
 Inner Shell 2.5mm aluminum
 Lock Euro Cylinder
 Standard Mounting On round Poles, 100-250 mm
 Environmental Protection Protection class IP65

FT3 STROBE

Flash Type	48 x IR LED
Peak Wavelength	850 nm
Flash duration	10 μ s - 1000 μ s Still: 10 μ s - 1000 μ s Video: 10 μ s - 250 μ s
Still Image Repetition Rate	max. 6 Hz
Video Frame Repetition Rate	max. 30 Hz

FT1 FLASH

Flash Type	Xenon Tube
Peak Energy	10 Ws
Flash Duration	50 μ s - 1000 μ s
Continuous Repetition Rate	0.5 Hz
Burst Repetition Rate	30 Hz - 4 consecutive flashes

GT20 CAMERA

Sensor Type	CMOS
Sensor size (full frame)	32.8 x 24.6 mm
Resolution	5120 x 3840 pixels
Image Format	4:3
Dynamic Reach	12 bit
Recording Capacity	30 fps
Videostream	Max. 1280 x 960 @ 30 fps
Lens Type	EF mount
Video	10 μ s - 250 μ s
Image Repetition Rate	Max. 6 Hz
Videoframe Repetition Rate	Max. 30 Hz

RT4 RADAR

Antenna Type	FMCW planar patch array
Bundle Shape	oval cone
Bundle Opening	55° horizontal 11° vertical
Measurement Direction	approaching and/or receding
Detection Range	10 - 80 meters

The radar detects vehicles between 0 and 150 meters. The T-Series restricts the trigger position between 10 and 80 meters.

WTLI

4 Traffic Light Inputs (3 lamps/light group available on connector Auxiliary Box)
