

The Redflex Red Light System Overview

The Redflex automated enforcement system is a computer-based digital imaging system designed and installed to capture violations of CVC 21453(a) and CVC 21453(c) at intersections designated by the city. Redflex Traffic Systems installed the system, under contract to the City of Redding. As an agent of the City of Redding, the employees of Redflex Traffic Systems are acting on behalf of the city and police department. They operate under the direction and supervision of the Redding Police Department.

RECORDING: The process of recording an incident occurs when the cameras take a series of four still photographs and a video camera captures a 12 second video, which depicts the elements of the violation. The recording of an incident occurs only during the red phase when a vehicle triggers the system by passing over two sensors placed in the roadway just prior to the limit line or crosswalk. These sensors record the time it takes for the vehicle to cross the distance between the sensors and calculates the speed of the vehicle based upon the distance and the elapsed time for the vehicle to cross it. There are two signals, referred to as an "A" and "B" signal, that are recorded by the sensors. These signals must agree for the system to complete an image capture sequence. If the speed of the vehicle is over a set threshold, then the system activates and fires the cameras. The speed calculated by the system is used to trigger the cameras and to time the image sequence.

APPROACHES: Three of the approaches: Market Street and Shasta Street (2), Pine Street and Tehama Street and Hilltop and Cypress use new-generation radar detection units, which are mounted on the overhead signal arms. They are able to track multiple vehicles and are lane specific. They measure the speed as the front of the vehicle crosses the limit line. The speed, whether measured by loop sensors or radar is also used to time the image sequence.

ACTIVATION: When the system activates, three digital cameras record four still images and a 12 second video. The first photograph from the rear shows the vehicle at the limit line with the light in the red phase. The second photograph depicts the car in front of the limit line or crosswalk, again with the light red. The third is a front photograph from which the face of the driver is obtained. The fourth is a photo of the rear to obtain the vehicle's license plate number. The video of the incidents is obtained by the video camera, which runs constantly to a 6 second buffer. The last 6 seconds in the buffer and the subsequent 6 seconds become the 12-second video clip.

ENCRYPTION: Each of the images is encrypted with a data bar at the top of the photograph. This contains information particular to that incident including the date and time of the incident, the location, the lane the vehicle was in, the vehicle speed, the posted speed limit, the time into the red cycle at the time of that photograph, and the elapsed time since activation. The camera system computer at the intersection generates the information contained in the data bar at the time the incident occurs.

CLOCK: The camera system computer clock is synchronized multiple times daily, usually hourly, to the Redflex time server. Multiple sources are queried by at least two servers to verify date and time, including time.nist.gov.

DIGITAL SIGNATURE: Each of the photographs, video, and data bar are encrypted with a digital signature based upon the location where the incident was captured and then stored on the computer at the intersection. This is a typical laptop style computer running Windows XP, and using 128-bit encryption.

UPLOAD: The data files are uploaded to Redflex Systems in Phoenix, Arizona, usually several times per day, using a Virtual Private Network. The VPN provides security by protecting the data from interception as it moves from the remote location to the secure image vault servers in Arizona. A digital signature is assigned to each portion of the incident, and each photograph. The digital signature verifies that the incident is valid and has not been tampered with. Any attempt to change any portion of the data file would result in the digital signature being invalid. Once the data arrives at the server in Arizona, the digital signature is confirmed. A working duplicate is produced for their staff to conduct initial screening and to send to us. This involves three separate reviews by at least two different employees. The computer stores the original untouched data file on the server in the secure image vault. This room is locked and secure in the center of the facility, with access by only two computer managers from the Redflex Company.

REVIEW AND VERIFICATION:

The **first** portion of processing involves basic verification of the incident – the 4 digital still images are reviewed to ensure all elements required for a violation are present: vehicle behind limit line, signal phase in red, face and plate images are clear, and a full video of the incident is present. Employees at Redflex can zoom, lighten, darken, and change the contrast on the duplicate working images. These adjustments are done only to the WORKING DUPLICATE copy of the photographs, not the ORIGINAL digital photograph file. The original data file and image file remain in the secure Image Vault servers and remains untouched by human hands until the certified court documents and photos are prepared.

The **second** phase of processing involves the entry of the registered owner of the DMV information. It is also during the first two phases when some incidents are rejected per guidelines set by the City of Redding. For example, if the violating vehicle has paper plates we instruct Redflex to reject the incident, as there is no way to identify the owner or driver of the vehicle.

The **third** phase of processing is quality control where a different employee reviews the incident before it is placed in the queue for me to view. Redflex rejects no incidents except those that fit specific guidelines established by the City of Redding. If an incident does not fit our guidelines then it is sent on to me for further processing and review.

The system is monitored by a three-step process to ensure it is functioning properly.

The **first step** is daily verification of operation, which means incidents are being imported from the remote location. It is then verified that the system has power and the vehicle detection system is communicating with the camera computer and the communication system is functioning.

The **second step** comes from monitoring the incidents for quality and to ensure that the system is functioning properly. Each incident is reviewed for items including: clarity, lighting, signal phasing, and vehicle location. If the system were not functioning properly, then the system would not take photographs at the appropriate times (i.e. photos of the vehicle, plate, and driver would not be in the frame).

The **third and last step** of the maintenance program is monthly data analysis that is used to identify trends that would indicate a problem. As provided by 21455.5 VC, the department contracts out the maintenance of the system to Redflex Traffic Systems.

Any anomalies that suggest system malfunctions or problems are immediately reported to maintenance and the approach is shut down until repairs or adjustments are completed.

MAINTENANCE:

Onsite maintenance consists of a maintenance technician from Redflex responding to any issues observed by either Redflex or City of Redding processing personnel. This includes monthly inspections of each location and equipment. During the monthly maintenance the technician inspects the system to ensure there is no physical damage to any of the components, checking the system computer and communication lines to ensure they are working properly, and to then activate the system to ensure it is recording accurately and the data bar is recording correctly.

The maintenance log from each inspection is generated by Redflex and a copy is sent to the Red Light Enforcement Specialists for review. Once a month they personally review the maintenance logs of the individual cameras to locate any problems, malfunctions or abnormalities in the system. The signs are checked monthly by the Red Light Enforcement Specialists to verify their presence, and verify the signals are phasing properly and confirm the yellow light timing.

Red Light Enforcement Specialists have personally observed the installation and location of all of the red light enforcement cameras placed at intersections in the City of Redding. This included reviewing the location of the computers and internet connections, which link the photo based system at each intersection to the computer servers in Arizona. These camera systems are remotely checked on a daily basis to ensure all components are functioning properly and that the on-site computer is synchronized with the main server.