

# LOS ANGELES COUNTY SHERIFF'S DEPARTMENT



## LAW ENFORCEMENT VEHICLE TEST AND EVALUATION PROTOCOL

FLEET MANAGEMENT BUREAU

LEROY D. BACA, SHERIFF

**HIGH SPEED DYNAMICS DRIVING COURSE**  
**ONE LAP = 1.46 MILES**

**CITY STREET PURSUIT COURSE**  
**TWO LAPS = 2.45 MILES**

# **32 LAP HIGH-SPEED VEHICLE DYNAMICS EVALUATION**

This test is conducted on a high-speed driving course. It is designed to evaluate, identify and eliminate the obviously unacceptable vehicles (i.e., those vehicles that are demonstrably unstable or otherwise exhibit unsafe characteristics).

For this test, four drivers are utilized for each vehicle. Each driver completes eight laps around our 1.46 mile test track at the AutoClub Speedway in Fontana, for a total of 32 timed laps. Lap timing is via a GPS based Race Logic "DriftBox02" data logger mounted in the vehicle. Lap times are immediately recorded via RF telemetry signal produced by the data logger. Secondary lap timing is recorded utilizing a "Video VBOX Data logger" mounted in the vehicle. All timing is backed up on SD cards in each unit. The fastest and the slowest lap times are eliminated, the remaining six lap times are averaged. The average time and speed are recorded next to the driver's name.

Four Emergency Vehicle Operations Center driver training instructors, two each from the Los Angeles County Sheriff's Department and Los Angeles Police Department share the driving and evaluation of these vehicles.

At the conclusion of the preliminary handling portion of the test, each driver completes a "Driver's Subjective Evaluation" form. If the test vehicle is judged unacceptable in this preliminary review, it is rejected and not subject to further testing and evaluation.

# **PURSUIT COURSE EVALUATION**

This test is for those vehicles equipped with a factory installed POLICE PACKAGE and identified by the manufacturer as pursuit vehicles. This evaluation is conducted on a closed 2.45 mile city street course which closely represents the environment most urban law enforcement agencies must contend with. The course has virtually no straight-a-ways and consists of right and left turns and obstacles in the roadway.

This is the final test during our road certification and the manufacturers, if they so choose, are allowed to rebuild the vehicle's brake system prior to this test.

For this test, two drivers are utilized for each vehicle. Each driver completes two laps around the city pursuit course. Lap timing is via a GPS based Race Logic "DriftBox02" mounted in the car. The combined times of the two laps are recorded next to the driver's name.

If the test vehicle is unable to complete the course in less than 4 minutes and 45 seconds, it is judged unacceptable for high speed law enforcement use.

# **BRAKE EVALUATION**

This test procedure measures the braking response and efficiency of the vehicle.

The test is conducted immediately following the preliminary handling test (32 laps). This ensures that the brakes are tested after being driven at high speeds, thus simulating the actual operating conditions experienced by the officer in the field.

The test is conducted by first accelerating the vehicle to 80 MPH, then decelerating to a stop, maintaining an average deceleration rate of 22 feet per second. This procedure is repeated three additional times. At this point, a five minute stationary cool down period occurs. The vehicle is then accelerated to a speed of 60 MPH and decelerated at the maximum deceleration rate attainable before the onset of ABS. After a two minute stop, the 60 MPH procedure is repeated again. As soon as the vehicle has stopped, it is immediately accelerated to 60 MPH and then stopped as quickly as possible, simulating a panic stop. That stopping distance is measured and recorded, utilizing a "VBOX Datalogger". The "Datalogger" is a GPS based measuring device. If a brake malfunction is experienced (i.e., severe fading or inability to stop in a straight line,) an effort is made to detect the cause of the brake failure. If it is decided that the failure is inherent in the engineering of the brake system of the vehicle, the test is discontinued and the vehicle is disqualified from further testing. If the failure is associated with a correctable situation, it is corrected and the test is rerun. The defect and any remedial action taken are noted in the test results.

# ACCELERATION EVALUATION

This test is designed to measure vehicle performance in terms of acceleration, including speed and time elapsed at the quarter mile. Although the top speed is not recorded, a minimum of 100 MPH is generally obtained to satisfy the requirements for high speed law enforcement patrol.

To get the information on the 30 – 60 MPH and 60 – 100 MPH two separate runs are driven. In each run, the vehicle is accelerated to just under the target mileage. The vehicle's speed is allowed to level off, and then the vehicle is accelerated through the target mileage. This allows for an actual time between the targeted mileages.

All of the information gathered during the acceleration and subsequent brake test is gathered using a RaceLogic "Drift Box 02" data logger. The data logger is a GPS based measuring device.

# HEAT EVALUATION

Today's modern exhaust emission and computer monitored automobile is designed to operate at much higher temperatures than vehicles from the 1970's and 1980's. Scientific breakthroughs in metallurgy and lubrication compositions allow the modern engine to operate at temperatures formerly thought to be detrimental. A vehicle from the 1970 era usually exceeded 180 degrees under normal driving conditions and generally overheated at 212 degrees. Today, modern engines operate safely between 200 to 260 degrees. Our heat testing is a "PASS-FAIL" scenario and is based on manufacturer's allowable operating temperatures.

Heat from each engine component is measured by a diagnostic tool via the vehicles data link connector. Components not electronically monitored by the onboard computers are measured by means of a digital thermometer.

Measurements are taken at the conclusion of the 32 high speed laps. This process is accomplished in the following manner:

1. Transmission Fluid      Measurement taken via DLC (data link connector).
2. Engine Oil              Measurement taken via DLC (data link connector).
3. Power Steering      The probe is inserted into the pump reservoir fluid.
4. Radiator Coolant      Measurement taken via DLC (data link connector)
5. Outside Air Temperature is measured away from the vehicle and in direct sunlight.

# COMMUNICATIONS EVALUATION

The communications evaluation of each vehicle is conducted by technicians assigned to the Los Angeles County Sheriff's Department's Communications and Fleet Management Bureau. This evaluation concerns itself with the radio installation, the effect of radio operation on vehicle performance and the effect of the vehicle on radio performance.

The Electromagnetic Interference Susceptibility test is intended for use in the presence of electromagnetic fields resulting from use of public safety two-way radios.

Vehicle performance must not be affected in any way by transmissions from a radio and antenna installed in the vehicle and operating in any of the frequency ranges of 450 to 512 MHz, and having a radio frequency output no more than 50 watts. Vehicle performance shall not be affected by the presence of another vehicle equipped with the above described radio and operated next to the subject vehicle.

Radiated and conducted electromagnetic interference vehicle systems and accessories shall be designed to reduce interference with the use of public safety radio receivers or electronic sirens or sound amplifiers. The effective sensitivity of a receiver installed in the vehicle shall not be reduced by more than the amount tabulated below for each frequency band:

FREQUENCY BAND	ALLOWABLE DEGRADATION
450 to 512 MHz	3 dB

Degradation is the difference in effective receiver sensitivity measured with the vehicle engine and accessories turned off as compared to that measured with the engine and accessories turned on.

Sensitivity is measured in terms of the 12 dB Sinad signal as defined in EIA Standard RS-204. To determine effective sensitivity, the receiver is connected to the antenna through an isolating the connector which allows introduction of the signal generator through the isolated port. Comparative signal strength readings are then taken with and without the interference present.



# ERGONOMICS

This subjective evaluation is a rating of human factors and space utilization done individually and independently by four patrol trained Deputy Sheriffs from the Los Angeles County Sheriff's Department. Each vehicle is driven through a 100 mile loop four times, each time by a different driver. The loop is divided equally into urban, suburban, and freeway driving conditions. The vehicle is operated with the air conditioner and headlights "turned on" and with the transmission selector in the overdrive position. No attempt is made to "baby" the vehicle through the loop, but hard acceleration starts are avoided. The ratings are averaged to minimize personal prejudices that individuals may have for, or against, any given vehicle.

Statements in the "drivers comment" section of the evaluation reflect a consensus of their individual comments.

Additionally, during the Ergonomics evaluation, fuel efficiency is also recorded. While EPA mileage estimates may be helpful for comparative purposes, they are based on simulated driving conditions. The fuel efficiency evaluation is an attempt to estimate MPG (miles per gallon) based on actual driving conditions.

The test results are averaged between the four drivers and recorded.

\*\* 1 – Poor      5 – Average      10 - Outstanding

# FUEL EFFICIENCY TEST

While EPA mileage estimates may be helpful for comparative purposes, they are based on simulated driving conditions. The fuel efficiency evaluation is an attempt to estimate MPG (miles per gallon) based on actual driving conditions.

Each vehicle is driven through a 100 mile loop, four times, each by a different driver. The loop is divided equally into urban, suburban, freeway and mountain roads. The vehicle is operated with the air conditioner and head lights "turned on" and with the transmission selector in the "overdrive" position. No attempt is made to "baby" the vehicle through the loop, however hard acceleration starts are avoided.