

LOS ANGELES POLICE DEPARTMENT
Radar Operator
1850-23300
Expanded Course Outline

Day-1

I. INTRODUCTION AND ORIENTATION 0600-0700 (60 Min)

A. Instructors

B. Administrative

1. Restrooms
2. Eating Locations
3. Attire
4. Telephones/Contact Numbers

C. Topics

1. Basic Principles
2. RADAR Effects
3. Case Law
4. Vehicle Code
5. Engineering and Traffic Surveys
6. Court Preparation and Testimony
7. RADAR Detectors and Jamming Devices
8. Field Experiments
9. Final Exam
10. Mock Court

D. Goals

1. Explain the goals and objectives of the RADAR Operator Program.
2. Become more effective in detecting and apprehending speed violators.

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3. Become more effective in testifying in court on speeding violations.

E. Objectives

1. Explain the Doppler Principle and basic RADAR operation.
2. Identify the operating frequency of their RADAR device.
3. Demonstrate proper installation (set-up) and testing of RADAR devices.
4. Explain proper use of Doppler Audio.
5. Explain “beam propagation” and calculate the beam width for a given distance.
6. Identify and demonstrate proper target identification techniques.
7. Recognize effects and phenomena created by radar interacting with the environment.
8. Identify and create the proper notes for a radar citation.
9. Identify the documents needed in a “radar evidence kit.” aka Court packet.
10. Be able to estimate the speeds of vehicles to within five (5) miles per hour accuracy.
11. Understand radar “JAMMING” and be able to identify readings generated by a jamming device.
12. Be able to describe the association between excessive speed and traffic collisions, injuries and deaths as well as the safety benefits of effective speed control.
13. Demonstrate the ability to prepare and present records and courtroom testimony relating to radar speed measurement and enforcement.
14. Identify and describe the laws, court rulings, regulations, policies and procedures affecting radar speed measurement and enforcement.
15. Identify specific radar devices used by their department and be able to describe their major components and functions.

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F. Student Responsibilities

1. Be on time for class
2. If you have conflicts because of court make sure that you inform the course coordinator or instructor.
3. If you are going to be late, notify course coordinator.
4. Dress Attire
5. Court

G. Grading

1. Quiz No. 1 (Day 1) – 15 Points
2. Quiz No. 2 (Day 2) – 20 Points
3. Speed Estimations, and RADAR Set-Up and Test (Day3) – Pass/Fail
4. Controlled Notes (Day 4) – 15 Points
5. Final Examination (Day 4) – 50 Points

II. PRINCIPLES OF RADAR - NHTSA

0700-0900 (120 Min)

- A. Crime vs. Traffic Collisions Clock
- B. Speed Kills
 1. Faster Vehicle = More Violent Traffic Collisions
 2. Faster Vehicle = More Energy
 3. Relationship between Speed and Energy
- C. Converting MPH to FPS
- D. The Basic Speed Law

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1. 22350 VC
 2. Reasonable and Prudent
- E. Stopping Distance
- F. Perception and Reaction Time
- G. Review
- H. Typical Stopping Distances
 1. Vehicle
 2. Truck
- I. Vehicle Total Stopping Distance Affected by:
 1. Speed
 2. Driver Ability
 3. Vehicle Capability
- J. Excessive Speeds
 1. Dangers
 2. Survivability
 3. Public Attitude
- K. Highway Traffic Trends
 1. Benefits of Speed Reduction
 2. Speed vs. Fatalities
- L. Three “E”s of Traffic
 1. Education
 2. Engineering

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3. Enforcement

M. Three Elements of Driving

1. Vehicle

2. Roadway

3. Driver

N. Critical Speed

1. Prevailing Speed

2. 85th Percentile

III. PRINCIPLES OF RADAR – BASICS

0900-1100 (120 Min)

A. RADAR Units

1. Stationary

2. Moving

B. Valid Needs for RADAR Enforcement

1. Speed-Related Traffic Collision Locations

2. Citizen Complaints

3. Frequent Violation Locations

4. Unusual Speed Regulation

5. Speed Surveys

C. Definition of RADAR

D. Two Basic Components

1. Radio Transmitter

2. Receiver

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E. History

1. Developed for Military During World War II
2. Expanded for Commercial Use (Air Traffic Control)
3. Developed for Police Speed Enforcement

F. Doppler Principle

1. Definition
2. Example
3. Applies to
 - a) Sound Waves
 - b) Light Waves
 - c) Radio Waves
4. Frequency Shift
5. Police vs. Commercial and Military RADAR

G. Relative Motion

1. Definition
2. Examples

H. Radio Waves

I. Frequency

J. Wavelength

K. Frequency Measurement

1. Waves
2. Cycles

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3. Hertz
4. Cycles Per Second

L. RADAR Bands

1. X-Band
2. K-Band
3. Doppler Shift

M. Doppler Shift and Doppler Frequency – Identical

N. Tracking History

1. Visual Observation
 - a) Identify Target
 - b) Estimate Speed
 - c) In Range
 - d) Check Environment
2. Audio Observation
 - a) Pitch
 - b) Clarity
3. RADAR Verification
 - a) Stable Reading
 - b) Lock – No Lock
4. 3 – 5 Seconds

Lunch 1100-1200

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IV. STATIONARY RADAR

1200-1400 (120 Min)

A. Safety Consideration for Site Selection

1. Without Impeding Traffic
2. Ability to Enter Traffic Safely
3. Safe Location to Stop Violator

B. Beam Length Infinite Unless

1. Reflected
2. Absorbed
3. Refracted

C. RADAR Decision Making Process is Affected by

1. Reflective Capability
 - a) Size
 - b) Shape
 - c) Composition
2. Position
 - a) In Relation to Other Vehicles
 - b) Location Within the Main Beam
3. Speed
4. All Are Equal Factors

D. Desirable Traffic and Road Characteristics for RADAR Site Selection

1. Reasonably well-spaced vehicular traffic
2. Not excessively hilly or curved

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3. Reasonably clear and unobstructed view of traffic
4. If using a moving RADAR, conditions should be such that there is a minimum possibility of distortion

V. BEAM PROPAGATION **1400-1600 (120 Min)**

- A. Favors Displaying Vehicle in Prescribed Bandwidth
- B. RADAR is not Lane Selective
- C. RADAR is not Target Selective
- D. RADIO Waves Travel at the Speed of Light
- E. RADAR Beam Consist of Main Beam and Side Lobes
- F. 85 Percent of Power in Main Beam
- G. Beam Width Comparison
- H. Beam Width Calculation

VI. QUIZ – DAY ONE (15 Points) **1600-1700 (60 Min)**

Day-2

VII. SET-UP AND TEST – STATIONARY **0600-0700 (60 Min)**

- A. ABC Method
 1. Antenna
 2. Box
 3. Current
- B. Internal Circuit Test
 1. Lamp Segment Test
 2. Internal Calibration Test

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3. Internal Automatic Test

C. External Test

1. Tuning Fork (Preferred)

- a) Never try to use a fork designated for one RADAR model to calibrate a different model
- b) Avoid striking the fork on a very hard surface
- c) Point the antenna upwards when testing
- d) Hold the fork parallel to the antenna face with only one tine facing the antenna
- e) Hold tuning fork ½ to 2 inches away from RADAR unit
- f) In cold weather bring fork temperature to a moderate temp

2. Vehicle with Calibrated Speedometer

VIII. MOVING RADAR

0700-0900 (120 Min)

A. Target Speed Calculation

B. Moving RADAR Transmits One Signal

- 1. Hot Spot = Low Doppler = Patrol Speed
- 2. Target Vehicle = High Doppler = Closing Speed

C. Tracking History (3-5 Seconds)

1. Video Observation

- a) Identify Target
- b) Estimate Speed
- c) In Range ($D=Sx1.47xt$)
- d) Check Environment

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2. Audio Observation

- a) Pitch
- b) Clarity

3. RADAR Verification

- a) Stable Reading
- b) Lock or No-Lock

4. Speedometer Verification

D. Angular (Cosine) Effect

- 1. Always in Favor of the Motorist
- 2. Misalignment Effect

E. Moving Radar Beam Range

F. Set-Up and Test

1. NHTSA Recommends Test of Unit at Start of Shift

2. ABC Method

- a) Antenna
- b) Box
- c) Current

3. Turn Unit On

4. Internal Circuit Test

- a) Lamp Segment Test
- b) Internal Calibration Test
- c) Internal Automatic Test

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- 5. External Test
 - a) Tuning Fork
 - 1) Patrol Fork – Low Doppler
 - 2) Closing Speed Fork – High Doppler
 - b) Vehicle with Calibrated Speedometer

IX. EFFECTS

0900-1100 (120 Min)

A. Introduction

- 1. Often constitute mis-operation, they are operator errors
- 2. Some are not legitimate
- 3. Most are momentary, “Ghost” readings
- 4. Lack supportive evidence

B. Natural

- 1. Usually involve weather
- 2. In some cases, can cause damage to equipment (extreme heat)
- 3. Most will only effect the range of a device but not the accuracy
- 4. Elimination of Effect

a) Tracking History

b) Maintain a Moderate Temperature

C. Man-Made

- 1. Sources of Interference from “manmade” objects – equipment or radio sources.
- 2. Radar jamming devices.

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3. Radio Frequency Interference = RFI. A radio source that could interfere with the radar device
4. Electro-mechanical Interference = EMI. Caused by mechanical devices such as air conditioning fans in vehicle.
5. Elimination of Effect
 - a) Tracking History
 - b) Avoid transmissions within 100 feet of radio sources
 - c) Disregard readings when transmitters are in use
 - d) Separate the power cord from the antenna cord
 - e) Choose suitable location
 - f) Avoid power substations

D. Operator

1. Angular effect always in favor of the motorist
2. Power Surge
3. Panning
4. Batching
5. Shadowing
6. Elimination of Effect
 - a) Antenna Alignment
 - 1) Aim the antenna parallel to the roadway insuring that no cosine is induced
 - 2) Do not track the target with the device as it gets closer (scanning – operator induced error)
 - b) Proper set up procedures

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- 1) Powering down before the engine is turned off
- 2) Modern two-piece units have surge protection
- c) Tracking History
- d) Speedometer Verification

X. Lunch 1100-1200
CASE LAW **1200-1400 (120 Min)**

A. State of Florida vs. Ana Aquilera

1. Not Case Law
2. Issues
 - a) Equipment
 - b) Training

B. National

1. D'Antonio vs. New Jersey

First National case to take judicial notice of the Doppler Principle.

2. Tomanelli vs. Connecticut

First National case to take judicial notice of the tuning fork to test for accuracy.

3. Honeycutt vs. Commonwealth of Kentucky

- a) Establishes the minimum qualifications for RADAR Operators.
- b) Officer training and qualifications.

4. State (Wisconsin) vs. Hansen

First National Case to hear Moving RADAR.

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C. State

1. Beamer

- a) RADAR is not a speed trap.
- b) First State case to take judicial notice of the Doppler Principle.

2. MacLaird

- a) Officers training and qualifications.
- b) Ability to set-up, test and operate the RADAR device.

3. Halopoff

Officer must present an engineering and traffic survey (ETS) or one of the exceptions without request.

4. Sterritt

The ETS justifies the posted speed limit.

5. Flaxman

- a) A certified copy of the ETS is admissible.
- b) The original ETS does not have to be present.

6. Miller

ETS are not required when enforcing the maximum speed limit.

7. Johnson

VASCAR is a speed trap.

8. Sullivan

40808 VC enacted.

XI. VEHICLE CODE

1400-1600 (120 Min)

A. 40800 VC – Full uniform and in marked vehicle

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1. Law
2. Exemptions
 - a) Auto theft detectives
 - b) Hit and run
 - c) Investigation of 23109 VC
 - d) Warrant service
- B. 40801 VC – Prohibition use of speed trap
 1. Cannot use speed trap to cite or arrest
 2. Cannot use a speed trap to secure evidence of speed
- C. 40802 VC – Definition of speed trap and ETS extensions
 1. Speed Trap Definition
 - a) Time – Distance
 - b) Prima Facie not justified by the ETS conducted within five years
 - c) Exemptions
 - 1) Local Street
 - 2) School Zone
 - 3) Senior Zone
 2. Extension of ETS
 - a) 7 Year Extension
 - 1) Officer attended 24-hour RADAR Operator Course
 - 2) Officer attended 2-hour LIDAR Operator Course if LASER Case

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- 3) Speed was unsafe for prevailing conditions unless maximum speed limit case
- 4) The RADAR or LIDAR unit meets or exceeds NHTSA requirements and has been calibrated within 3 years

b) 10 Year Extension with engineering recommendation.

D. 40803 VC – Fruit of a poisonous tree

1. No evidence admitted if obtained from a speed trap
2. Prosecution must establish the evidence is not based on a speed trap

E. 40804 VC – When an officer cannot testify

If evidence is obtained from a speed trap, the officer is incompetent as a witness

F. 40805 VC – When a court cannot hear a case

Courts are without jurisdiction to render a conviction when testimony is based on a speed trap

G. 40808 VC – Sullivan case

Officer must present a RADAR case as the probable cause for the stop leading to the arrest

H. 22350 VC – Basic speed law

1. Rebuttable
2. Definition

I. Prima Facie Speed Limit

1. Rebuttable
2. Definition

J. 22349 VC – Maximum speed limit

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1. Non-Rebuttable
2. Definition

XII. QUIZ – DAY TWO (20 Points)

1600-1700 (60 Min)

Day-3

XIII. ENGINEERING AND TRAFFIC SURVEYS

0600-0800 (120 Min)

A. Purpose for Conducting an ETS

1. Determines safe and reasonable speeds
2. Orderly and efficient flow of traffic
3. Non-maximum speed limits

B. Importance of Realistic Speed Zones

1. Satisfies State Law
2. Invites Public Compliance
3. Offer Effective Enforcement Tool

C. ETS Requirements

1. Must Comply with CalTrans Regulations
2. Determination of Prevailing Speed of Traffic
3. Evaluation of Roadway Accident History
4. Evaluation of Conditions Not Apparent to Driver
5. Additional Requirements
 - a) North Arrow
 - b) Engineers Station or Post Mileage
 - c) Notations Showing Type of Roadside Development

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- d) Average Traffic Volume
- e) If Divided Highway, Limit Zones for Each Direction
- f) Pedestrian and Bicycle Traffic

D. Local Street Defined

- 1. Provides Access to Abutting Residential Property
- 2. 40 Feet or Less in Width
- 3. No More Than ½ Mile Uninterrupted Length
- 4. One Traffic Lane in Each Direction
- 5. Lowest Level of Mobility and Usually No Bus Routes

E. ETS Exemplars

XIV. COURT PREPERATION AND TESTIMONY

0800-1000 (120 Min)

A. The Citation

- 1. Officer/Violator Contact
 - a) The Greeting
 - b) Identify Yourself
 - c) The Reason for the Stop
 - d) Justifications
 - e) Documents
 - f) State Intention on Citing
 - g) Notice to Appear
 - h) Explanation of Citation
 - i) Signature

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j) Departure

2. Selling the Citation

- a) Explain the Reason
- b) Do Not Offer Advice
- c) Refer to Back of Notice to Appear

3. Citing Techniques

- a) Citation Book
- b) Abbreviations
- c) Pertinent Information
- d) Note Taking
- e) Recordings

B. The Court Package

1. Source Document

- a) Speed Estimation Sheet
- b) Radar Certificate (copy)
- c) Laser Certificate (copy)

2. Device Certificate (copy)

3. Any additional Evidence (i.e. photographs, recordings)

C. Important Factors for a RADAR Court Case (CODE)

1. Commitment to Accuracy

- a) Tracking History
- b) Set-Up and Test

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- c) Professionalism
 - 2. Officer's Preparation
 - a) Begins before the citation is written
 - b) Review notes
 - c) Revisit the scene
 - d) Possible diagrams or photographs
 - 3. Demeanor
 - a) Attire
 - b) Attitude
 - c) Professionalism
 - 4. Experience and Training
- D. Court Testimony
- 1. Introduction of the Survey or exception
 - 2. State Qualifications
 - 3. Uniform and Vehicle
 - 4. Set-Up and Test
 - 5. Tracking History
 - 6. Explain Prima Facie Elements
 - 7. Clear and Unobstructed View
 - 8. Occurred in the City and County of Los Angeles
 - 9. No Further

XV. DETECTORS AND JAMMERS

1000-1100 (60 Min)

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- A. 28150 VC – Jamming Devices
- B. Senate Bill 1964 – Prohibits:
 - 1. Jamming device
 - 2. Buying, possessing, manufacturing, selling, Jamming device
- C. Legality of RADAR detectors
- D. FCC license
 - 1. Required to operate a Jamming License
 - 2. Exceptions
 - 3.

Lunch 1100-1200

XVI. FIELD EXPERIMENTS

1200-1500 (180 Min)

- A. RADAR Effects
- B. RADAR Set-Up and Test
 - 1. Moving
 - 2. Stationary
- C. Speed Estimations

XVII. INDEPENDENT STUDY

1500-1700 (120 Min)

Day-4

XVIII. COURSE REVIEW

0600-0700 (60 Min)

XIX. FINAL EXAM (50 Points)

0700-0800 (60 Min)

XX. MOCK COURT

0800-1100 (180 Min)

Controlled Notes Due (15 Points)