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GUIDELINES AND SAMPLE TRAINING WORKBOOK FOR POLICE ENFORCEMENT OF NOISE REGULATIONS

EPA Contract Number 68-01-4701

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Prepared for
U.S. ENVIRONMENTAL PROTECTION AGENCY
Noise Enforcement Division
Washington, D.C. 20460

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INTRODUCTION

This report is one of the products of a contract between the EPA's Noise Enforcement Division and Jack Faucett Associates, Inc. One purpose of the contract is to develop materials suitable for use in training State and local police officers to enforce their noise control laws.

The project began in September 1977 with a nationwide investigation of the methods and results of police departments that had active noise control programs. A large sample was collected of the various types of laws and regulations that the police enforce, of the procedures that they follow in their enforcement, of the data and records that they collect and keep, and of the problems that they face. This information was used in developing two training courses.

The first course was designed to train active duty police officers to enforce their own specific laws. The second course was designed to train instructors at police academies and at similar institutions to conduct the first course. The first course, a two-day session, was presented at the police academy in Allentown, Pennsylvania, in July and August 1978 and at the police academy in Des Moines, Iowa, in November 1978. The second course, a three-day session, was presented at a police training facility near Boston, Massachusetts and at the police academy in Seattle, Washington, in September 1979. This document includes material and procedures that were used in both types of training courses.

This report has had the benefit of the comments and suggestions from more than a hundred trainees in the five training sessions, from the personnel in the EPA headquarters, and from the EPA Regional Noise Control staff whose comments were particularly useful.

Mr. John S. Winder, Jr., and Ms. Kathy Summerlee were the EPA's project monitors, Mr. M. E. Hawley was Jack Faucett Associates' project director.

I. GUIDELINES

A. Conduct of Training Sessions

1) Time and Duration. In most jurisdictions, noise control laws provide that legally binding measurements cannot be made in the rain. In addition, rain damages microphones and interferes seriously with the field demonstrations and experimentation, which are the parts of the course in which the trainees will learn most of what they retain. The sessions should be scheduled for a time when it is warm and unlikely to rain. Every course should have a plan as an alternative to the outdoor sessions, in case of rain, but the course will be less effective if the rain plan must be used. A course in which the trainees are expected to learn to enforce both motor vehicle and non-motor vehicle noise control laws should last four 7- or 8-hour days. If only motor vehicle laws are to be considered, two 8-hour days may suffice. The schedule in the Sample Workbook covers two days; if there is additional time, it should be spent on practice in the field.

2) Location. The training facilities and environment of a police academy are ideal. The officers, especially if they are in uniform, will not disturb other activities at an academy as much as they might in a civilian site. In any facility there should be good access to open space for demonstrations so that neighbors are not disturbed by noisy demonstrations; parking facilities should be ample for the trainees' cars; and eating facilities should be on site or close by. A police academy satisfies all of these desirable characteristics.

3) Instructors. As much of the training as possible should be done by police officers. An officer should do the introduction. An acoustical engineer is perfectly acceptable as the trainer on the principles of sound and on the concepts of the sound level meters. Hands-on experience and field demonstrations should be given by experienced police officers. The other portions of the course may be given by civilians, but, if a qualified and skilled police officer can be found, he or she will more likely be a more effective trainer. Try to have one such officer-trainer for each 3-5 trainees.

4) Trainees. If at all possible, the trainees should be police officers who have volunteered for training and for duty as noise control law enforcers. They should have been given some advance notice that instruments will be used and that some technical inclination and experience will be helpful although not essential. A suggestion that taking noise level measurements is about as complicated as taking pictures with a camera may be helpful.

5) Training Materials. The trainees should be furnished with a complete text of all the regulations, procedures, forms, and similar materials that they will use for noise enforcement. A workbook like this one is a convenient place to keep all the training materials together. The glossary, summary of field measurement procedures, data sheets, and sample courtroom testimony in the sample workbook should be applicable to all training sessions. The workbook should be given to the trainees at the very beginning of the course. It also may be useful to send the list of attendees to them, in advance.

6) Instructor Preparation.

a) Have thorough familiarity with all aspects and interpretations of the regulations that will be taught. All legal issues should be resolved ahead of time so that the instruction can be authoritative and specific. Know the limits of the police authority and the names of other agencies that enforce noise laws.

b) Be familiar with the locality (local customs, conditions and problems) so that the presented materials have a local flavor and local validity. Know the local police department's present methods of handling noise complaints, of investigating disturbances, of responding to alarms, of issuing permits for emergency repairs and construction, of stopping and checking motor vehicles, of issuing citations, and cooperating with State police officers in motor vehicle noise cases.

c) Know the organization, training, assignment procedures, and principal officers of the local police department. The information in this and the preceeding paragraph often need not be stated or be obvious in the

presentations, but familiarity with it will help to avoid errors on which the local trainees may remark and which therefore will weaken the forcefulness of the presentations.

d) Prepare slides that show local scenes where noise laws may be enforced. Use pictures of local noise sources, local sites which are suitable/unsuitable for noise measurements, local customs or events that may be important to noise abatement, and local people making noise measurements.

e) Investigate, arrange, and check out thoroughly all the training equipment, training sites, alternate facilities and equipment, transportation facilities, food facilities, and similar arrangements before the training sessions.

f) Develop an alternative plan in case it rains. This plan should include indoor simulation of field conditions with recorded noises.

7) Audio-visual Aids.

a) Use numerous, informal color slides. Be sure that the projector and all the slides are suitable to allow showing the slides with the lights on.

b) Sound recordings are very effective in a course on sound and noise. Use demonstrations of pure tones at the same intensity and different frequencies as a substitute for explaining equal loudness contours. Show the sound of pass-by vehicles, of stationary noise soures, of intermittent noises, of impulse noises, and so forth.

c) Avoid graphs; rely on tables for correction factors, etc. and use pictures to demonstrate distance relationships.

8) Contents of the Presentations.

a) At the beginning and at intervals throughout the course tell the trainees what the course objectives are and what the trainees should be able to do at the end of the course. Remind them of what will be expected of them at the course's conclusion.

b) Communication is as important as technical accuracy, so avoid long specialized words. Say "spreading" or "travel over the ground" instead of "propagation". Say "decay" or "reduction with distance" instead of "attenuation". Avoid referring to decibels as logarithmic units, just say they are units of sound pressure.

c) Before the process of addition and subtraction of sound levels is explained, explain why one needs to add and subtract them. This part of the presentation is frequently the most confusing to laymen.

d) Work in whole numbers of decibels as much as possible.

e) Explain the A, B, and C scales on the sound level meter, but concentrate on the A scale. Explain dB(A) as a form of sound measurement that is chosen because it measures noise as the ear responds to noise.

f) Give the names and addresses of the organizations that can help with the selection and calibration of equipment and with further technical help.

g) Explain how to get assistance from the regional EPA noise representative and the services which one can expect from such a representative.

h) Play down the problem of appearance in court. Explain that most cases never get to court. Motor vehicle violations do not involve penalty points so usually the cases are unopposed. Other noise cases usually involve fines so small that they are not contested either. Tell the trainees to be prepared to answer the questions in the material on court appearances in the Workbook and to discuss this material with the prosecuting attorney.

9) Demonstrations and Field Work.

a) Have a full set of equipment, including windscreen, sound level meter, calibrator, headphones, screwdriver, and wind gauge for each 3-5 trainees and give a set to each police instructor. During the lecture on the sound level meter, let each police instructor begin to take out and demonstrate the equipment as the lecturer describes the components. Then let 3-5 trainees cluster around the police trainer who will take over from the lecturer and begin the hands-on experience that will lead to the outdoor demonstration and participation experience. During the outdoor demonstrations set up the equipment and monitor sample vehicles as they pass by the sites. Later, if it is possible, allow the trainees to select a measurement site within the community where they can set up their equipment and make measurements of vehicles in normal traffic.

b) Use the kind of meters that the police will use, but avoid initial demonstration training on sound level meters that use digital displays. Train the police to read the swinging needle and to relate the movement of the meter's needle to what they hear. Emphasize the advantage of and the need for listening carefully to augment and to improve the knowledge of the acoustical situation as it is measured on the meter. A digital meter inhibits this learning. If the police are going to have digital meters with the peak hold feature, which is very convenient and effective in use on the street, introduce these meters at the end of the training after the habit of watching the needle has been learned. (Non-digital meters often may be borrowed from EPA.)

c) Show, on actual vehicles, where defective components are or might be.

10) Concluding Procedures.

a) Give examinations on the course work covered at the end of each day. Give an open book, multiple-choice test at the end of the course. An example is given on pages 48 through 51 of this document.

b) Ask the trainers to fill out an evaluation sheet such as the sample given on pages 46 and 47 of this document. It will allow the trainees to express their thoughts and give you valuable feedback.

c) Issue a certificate at the end of the course, but send it to the graduate via the chief of police, to whom the graduate's grades in the course also should go. If the certificate can be one from a regular police academy, so much the better. (An example is given on page 53 in this document.)

B. Adaptation of the Sample Workbook

The remainder of this volume consists of a sample workbook which can be adapted to suit the specific laws, regulations, requirements, and conditions of each training session that includes instruction in making sound level measurements. The methods in the sample workbook are generally compatible with the measurement procedures used by the U.S. Department of Transportation* to enforce the noise regulations that apply to interstate motor carriers. The methods are similar to those used by the States of California, Florida, Illinois, Maryland, and Pennsylvania. Some jurisdictions use quite different procedures and in these cases the adaptation of the workbook for use by local officers will be much more extensive.

Unless materials are available which are more specific to the local situations, the following sections from this workbook can be included verbatim in the adapted workbook:

Summary of field measurement procedures
Glossary of terms
Sound levels of typical noise sources
Sound level as a function of distance from a small source
Adding and subtracting sound levels (a chart for approximate answers)
Sample courtroom testimony
Course evaluation sheet

*"*Guidelines for the Measurement of Interstate Motor Carrier Noise Emissions*", U.S. Department of Transportation, Federal Highway Administration, Bureau of Motor Carrier Safety, FHWA-TS-77-222 (1977)*

In the remaining sections the adapted workbook must include materials which are specific to the jurisdiction for which the training is intended. At the completion of the course, it is suggested that the trainees should be given an examination similar to the sample shown on pages 49 through 52. A certificate such as the example shown on page 53 should be sent to each trainee who successfully completes the training. It is desirable to indicate the duration of the training on the certificate.

II. SAMPLE TRAINING WORKBOOK FOR POLICE ENFORCEMENT OF NOISE REGULATIONS

A. Introduction
B. List of Attendees
C. Course Schedule and Content
D. Applicable Motor Vehicle Noise Regulations
E. Motor Vehicle Noise Enforcement Field Manual
F. Summary of Field Measurement Procedures
G. Motor Vehicle Noise Measurement Data Sheet
H. Applicable Non-Motor Vehicle Noise Regulations
I. Stationary Noise Measurement Data Sheet
J. Glossary of Terms
K. Sound Levels of Typical Noise Sources
L. Sound Level as a Function of Distance for a Small Source
M. Addition and Subtraction of Sound Levels
N. Sample Courtroom Testimony
O. Evaluation Sheet
P. Examination
Q. Certificate

INTRODUCTION
(Sample)

This workbook is an aid to the training sessions and a supplement to the classroom experience. The two-day sessions will cover the following topics:

Principles of sound and noise
Use of measuring instruments — explanation and hands-on experience
Use of measuring instruments — field experience
Regulations and measuring procedures for motor vehicles
Enforcement procedures for motor vehicles
Field training at a motor vehicle noise measurement site
Regulations and measuring procedures for non-motor vehicle sources
Enforcement procedures for non-motor vehicle sources
Enforcement problems and their solutions
Preparation for appearance in court
Review and examination
Evaluation of the course

At the conclusion of the sessions, the trainees are expected to be able to enforce all of the provisions of the laws and regulations that are assigned to them for enforcement.

This workbook contains complete texts of these laws and regulations and several items of reference information, checklists, definitions, and samples of forms that will be referred to in the training and will be useful after the training sessions are completed. Several of the tables and charts give only approximate values for the answers to problems requiring calculations. These tables and charts are suitable for determining in the field whether there is a violation.

This training session is sponsored by _____.

LIST OF ATTENDEES
(Sample)

(Give name, rank, department, address, and telephone number)

Sgt. Joseph K. Howell
Troop H
Pennsylvania State Police
Harrisburg, Pennsylvania 17120
(717) 308-1500

POLICE ENFORCEMENT OF NOISE REGULATIONS

COURSE SCHEDULE AND CONTENT

First Day

8:00 REGISTRATION

8:15 INTRODUCTION

1. Welcome
2. The Purpose of the Course
   a) Training
   b) Improvement of course
3. The Purpose of Noise Enforcement in General
4. The Legal Authority for Noise Control Laws
5. The Reasons for Police Involvement
6. A Preview of Course Content
7. Introductions of Teaching Staff and Assistants

8:30 PRINCIPLES OF SOUND AND NOISE

1. Sound
   a) Definition
   b) Causes
   c) Spreading and decay
   d) Characteristics
      i) intensity (decibels and sound level)
      ii) frequency (hertz)
      iii) time variation
2. Noise
   a) Definition
   b) Sources

3. General

a) Visualization and examples of types of sound
   i) steady
   ii) slowly fluctuating
   iii) rapidly fluctuating
   iv) intensity and frequency variation

b) Range of human hearing
   i) intensity
   ii) frequency

c) Loudness curves

d) Frequency weighting curves
   i) A
   ii) B
   iii) C
   iv) A-Weighting

e) Sound spreading and decay
   i) types of sources
   ii) reflecting surfaces
   iii) ambient sound level
   iv) barriers
   v) directivity
   vi) effects of weather

f) Adding and subtracting decibels

g) Tape recordings of different sounds

h) Question and answer period

10:15 BREAK

10:30 USE OF MEASURING INSTRUMENTS

1. SOUND LEVEL METERS used by Police Departments

2. Points at Which Sound is Measured

3. Sound Level Meters

a) Components
   i) filter
   ii) fast/slow response
   iii) scale
   iv) attenuator
   v) microphone

b) How to read a sound level meter

c) Types of sound level meters

4. Acoustical Calibrators

5. Basic Measurement Conditions

   a) Microphone height and position
   b) Reflecting surfaces
   c) Ambient noise level
   d) Weather (wind, rain, or snow)
   e) Meter settings

6. Potential Problems

   a) Damaged diaphragm
   b) Humidity
   c) Out of calibration
   d) Low batteries

7. Hands-on Measurement Experience With Different Sound Sources

8. Question and Answer Period

12:00 LUNCH

1:00 USE OF MEASURING INSTRUMENTS —

FIELD EXPERIENCE

1. Examine Features of the Site

2. Set up Sound Level Meter on Tripod

3. Calibrate

4. Measure Wind

5. Measure Distances

6. Fill Out Data Sheets

7. Measure Test Vehicles and Ordinary Traffic

8. Report Results

2:30 BREAK

2:45 MOTOR VEHICLE NOISE REGULATIONS

1. Provisions of Specific Regulations

   a) Applicability
   b) Definitions
   c) Noise limits
   d) Administrative provisions
   e) Instrumentation and calibration
   f) Measurement techniques
   g) Ambient conditions

2. Field Work

4:30 REVIEW

4:45 EXAMINATION

Second Day

8:00 NON-MOTOR VEHICLE (OR STATIONARY)

NOISE REGULATIONS AND FIELD MEASUREMENTS

1. Provisions of Specific Regulations

   a) Curfews and duration limits
   b) Restrictions on locations of noise sources
   c) Equipment restrictions
   d) Nuisances
   e) Audibility
   f) Noise levels at specific distances from the source
   g) Noise levels at a property line

2. General Considerations

   a) Administrative provisions
   b) Instrumentation and Calibration
   c) Measurement techniques
   d) Ambient conditions

9:15 NOISE ENFORCEMENT PROCEDURES

1. Motor Vehicles

2. Non-Motor Vehicles

10:15 BREAK

10:30 NOISE ENFORCEMENT PROBLEMS AND SOLUTIONS

1. Types of Problem Sources

   a) Motor vehicles
   b) Chain saws
   c) Mini-bikes
   d) Big-wheel bikes
   e) Air conditioning units
   f) Portable air compressors
   g) Stereos
   h) Burglar alarms
   i) Parties
   j) Dogs barking

2. Problems in Ambient Noise Measurement

3. Multiple Sources

4. Moving "Stationary" Sources

   a) Dump truck
   b) Lawnmower

5. Between Dwelling Units

11:30 PREPARATION FOR COURT APPEARANCE

1. Training and Experience

2. Proper Technique

3. Proper Law Interpretation

4. Proper Data Records

5. Sample Questions

12:00 LUNCH

1:00 FIELD TRAINING AND OBSERVATIONS AT A MOTOR VEHICLE TEST SITE

1. Wind Speed

2. Ambient Levels

3. Roadside Set Up and Site Qualifications

4. Roadside Noise Measurements

5. Filling Out Data Sheets

4:00 REVIEW

4:30 COURSE EVALUATION

4:45 EXAMINATION

Annex A
Title 67 Transportation
Department of Transportation

CHAPTER 450

ESTABLISHED SOUND LEVELS

PART 1 GENERAL

450.1 Purpose:

(a) Purpose: These regulations prescribe procedures for inspection, surveillance and measurement of motor vehicles operated on any highway to determine whether those vehicles are constructed, equipped, maintained, and operated to conform with the established sound levels set forth in Section 450.11 of this regulation.

(b) Exceptions: These regulations do not apply to:

(1) fire equipment.

(2) racing vehicles which are operated in an organized racing or competitive event conducted under a permit issued by local authorities.

450.2 Definitions:

"Ground cover" - Any of various low, dense-growing plants, such as ivy, myrtle, low weeds, or brush.

"Hard test site" - Any test site having the ground surface covered with concrete, asphalt, packed dirt, gravel or similar reflective material for more than 1/2 the distance between the microphone target point and the microphone location point.

"Microphone line" - An unmarked reference line running parallel to the vehicle path and passing through the microphone.

"Microphone point" - The unmarked location on the center of the lane of travel that is closest to the microphone.

"Relatively flat" - A noise measurement site which does not contain significant concave curvatures or slope reversals that may result in the focusing of sound waves toward the microphone location point.

"Soft test site" - Any test site having the ground surface covered with grass, other ground cover, or similar absorptive material for 1/2 or more of the distance between the microphone target point and the microphone location point.

"Traffic railing" - Any longitudinal highway traffic barrier system installed along the side or median of a highway. A traffic railing must have at least 35% of its vertical height, from the ground surface to the top of the railing, open to free space in order to qualify as an acceptable object within a noise measurement test site. Posts or other discrete supports shall be ignored when ascertaining open free space.

"Vehicle reference point" - The location on the vehicle used to determine when the vehicle is at any of the points on the vehicle path. The primary vehicle reference point is the front of the vehicle. For vehicles with a gross vehicle rating of 6,000 pounds or more, where the distance from the front of the vehicle to the exhaust outlet is more than 16 feet, the secondary vehicle reference point is the exhaust outlet.

PART 2 NOISE LIMITS

450.11 Vehicular Noise Limits:

(a) Prohibition: No person shall operate either a motor vehicle or combination of vehicles of a type subject to registration at any time or under any condition of grade, load, acceleration or deceleration in such a manner as to exceed the following noise limit for the category of motor vehicle within the speed limits specified in Table 1.

Table 1. Maximum Permissible Sound Level Readings (decibel [a])

Highway operations test

	soft site		hard site	
	35 mi/h or less	Above 35 mi/h	35 mi/h or less	Above 35 mi/h
(1) Any motor vehicle with a manufacturer's gross vehicle weight rating of 6,000 pounds or more and any combination which includes such a motor vehicle	86	90	88	92
(2) Any motorcycle other than a motor-driven cycle	82	86	84	88
(3) Any other motor vehicle or combination	76	82	78	84

(b) Measurement distance: The noise limits established by this section shall be based on a distance of 50 feet from the center lane of travel within the speed limit specified in this section. Measurements at distances closer than 50 feet from the center of the lane of travel may be made. In such a case, the measuring device shall be so calibrated as to provide for measurements equivalent to the noise limit established by this section measured at 50 feet.

(c) Trucks: A truck, truck tractor, or bus that is not equipped with an identification plate or marking bearing the manufacturer's name and manufacturer's gross vehicle weight rating shall be considered as having a gross vehicle weight rating of 6,000 pounds or more if the unladen weight is more than 5,000 pounds.

(d) The rules in this part do not apply to--

(1) The sound generated by a warning device, such as a horn or siren, installed in a motor vehicle, unless such device is intentionally sounded in order to preclude an otherwise valid noise emission measurement;

(2) An emergency vehicle, such as a fire department vehicle, police vehicle, ambulance, blood-delivery vehicle, armed forces emergency vehicle, and private vehicle of fire or police chief or assistant chief or ambulance corps commander or assistant commander or of a river rescue commander or other vehicles designated by the Pennsylvania State Police as emergency vehicles, when responding to an emergency call;

(3) A snow plow in operation; or

(4) The sound generated by special mobile equipment which is normally operated only when the motor vehicle on which it is installed is stopped or is operating at a speed of 5 miles per hour or less, unless such device is intentionally operated at speeds greater than 5 m.p.h. in order to preclude an otherwise valid noise measurement.

MOTOR VEHICLE NOISE ENFORCEMENT FIELD MANUAL

(Example)

This manual has been designed to supplement the provisions of the Pennsylvania Department of Transportation Regulations Title 67, Chapter 450, "Established Sound Levels", effective August 27, 1977. This manual is to be used as a guide only and is not sanctioned or approved by any official agency of the Commonwealth of Pennsylvania.

CONTENTS

1. Purpose and Introduction

This field manual will assist police officers in enforcing the motor vehicle noise regulation. It outlines how to select sites for enforcement, how to set up a checkpoint, and how to operate the noise measurement equipment.

2. Equipment Requirements

a) Approved Sound Level Meter
b) Tripod (optional)
c) Acoustical Calibrator
d) Cable (optional)
e) Wind Gauge
f) Windscreen
g) Screwdriver
h) Data Sheets and Pens
i) Headphones (desirable)

3. Site Selection

a) Select an upgrade site.
b) Consider stop and go traffic.
c) Determine if the site is "hard" or "soft".
d) Measure the site to make sure that its dimensions meet the requirements of the regulation and that it is adequately free from reflecting surfaces.
e) Mark the microphone positions so that the site can be used easily for future noise measurements.
f) Note and record appropriate site characteristics.

4. Equipment Set-Up and Calibration

a) If possible, set up the microphone to monitor more than one lane of traffic.

b) If the microphone attaches to the Sound Level Meter via a cable, be sure all connections are tight.

c) Check batteries of the calibrator and Sound Level Meter.

d) Turn the meter on and allow it to warm up for at least 1 minute.

e) Set the weighting scale to the position the manufacturer specifies for use with the calibrator; this is commonly the "A" scale.

f) Set the meter response to "fast" as required by the regulation.

g) Set the meter to the range appropriate for calibration so that the needle on the meter does not swing hard and hit the peg at the end of the scale.

h) Attach the calibrator to the Sound Level Meter and turn on the calibrator.

i) Adjust the meter with screwdriver to coincide with the calibrator output.

j) Recheck the meter with the calibrator at appropriate intervals until meter stablilizes. If the needle on the meter moves more than 0.3 dB, the meter or calibrator is probably not functioning properly.

5. Meter Operation and Citation

a) After the Sound Level Meter is calibrated and the calibrator is removed and turned off:

- Set the meter on the "A" weighing scale.
- Attach the windscreen.
- Preferably when there is a lull in traffic, measure the ambient noise level and record it. If the level is 10 dB less than the appropriate limit in the regulation, measurements may proceed.

- Observe traffic flow; if the flow is such that the meter swings up and back at least 6 dB for vehicles with noise levels that approach the limits, measurements may proceed.

- If the measurement distance(s) is different from the standard distance in the regulation, apply the distance correction(s) as specified by the regulation.

- If multiple lanes are used, note the appropriate noise limit for each class of vehicle for each lane, using the proper combination of site (hard or soft) and of legally permissible speed (35 mph or less or above 35 mph).

- Most vehicles will not exceed the noise limits; hence, subjectively you will be able to note the louder vehicles that may be in violation of the regulation. Thus you will probably be able to identify the louder vehicles as they approach.

Watch the sound level meter as the loud vehicle approaches; the meter should swing upwards by at least 6 dB. Note the maximum sound level when the vehicle is in the measurement area. Also, as the loud vehicle is going away, watch the meter to see the needle reading reduce by 6 dB before it starts increasing for the next vehicle.

If a tolerance is used, subtract it from the measured sound level and compare the difference with the appropriate noise limit.

If the needle does swing sufficiently, and if the appropriate limit is exceeded, the vehicle is in violation and appropriate enforcement action, such as issuing a citation or warning, can be taken.

You should be able visually to identify the source, e.g. a deteriorated muffler, which has caused the excessive noise.

6. Reporting Requirements

In order to withstand a Legal challenge, the procedure, instruments, and site conditions must be documented. Following are minimum reporting requirements:

a) Day, date, time

b) Site location, description, topography and unusual site features, sketch with microphone location and height described

c) Equipment used, by type of equipment, model, manufacturer and serial number

d) Calibration check completed

e) Meter settings

f) Ambient noise level

g) Description of the vehicle and driver in violation, license number, driver's name and address

h) Sound level permitted and sound level measured. Tolerance allowed

i) Weather conditions

7. What to Look For

a) Trucks

The major sources of noise are from the exhaust, the tires, and the engine area. The regulation requires a different vehicle reference point if the exhaust is more than 16 feet from the front of the vehicle. Another source of noise is that produced from the load or equipment attached to the truck (cement trucks are typical of this type).

b) Automobiles

The major sources of noise are from faulty exhaust systems, modified exhaust systems, snow tires at high speed, exhibition speed, or "peeling" rubber when accelerating.

c) Motorcycles

Noise from modified or defective exhaust systems is generally the predominant noise source; on occasion engine noise may dominate and be excessive.

8. Arrests *(This section is for illustration and suggestion only.)*

Cite the operator of the motor vehicle:

a) Sound level limit exceedence
b) Equipment malfunction

Citations are written on a regular traffic summons. The title of the citation is "Excessive Noise ____dB(A)" or "Improper Muffler. . . _____dB(A)". Fill in the blank with the meter reading.

If the muffler or pipes are defective or in need of repair, cite using the defective equipment section of the motor vehicle code. This section requires the violator to fix the vehicle and to bring it in for a retest. You will have to tell the violator about the mandatory retest and to give him or her a retest schedule.*

If the excessive noise is created by intentionally modified equipment (for example, removing the baffles from motorcycle pipes or making a cutout in the exhaust pipe ahead of the muffler), cite using the modified equipment section of the motor vehicle code.

If the excessive noise is created by the way in which the violator drives the vehicle, cite using the established sound levels section of the motor vehicle code.

*Some motor vehicle codes permit the offender to offer a receipt from an officially authorized muffler shop as sufficient evidence of correction.

Juveniles will have to be cited under the appropriate state code. Even though there is no retest provision in this section, treat them the same as under City Code — that is, if the muffler is old and needs repair, give them a chance for a retest. But if they're running straight pipes or otherwise intend to make noise, do not give them a chance for a retest.

For those who can take the retest, set the court data at least seven days in advance. This gives them a chance to repair the vehicle and bring it to the retest site. For those who do not get a chance for retest, set the court date as for any normal traffic summons.

Keep in mind that you can make arrests for vehicles in traffic lanes other than the closest one. But make sure there is no vehicle in the lane between you and the noisy vehicle. Once again, make sure you can identify by ear which vehicle is causing the excess noise.

9. Retests

Retests should be allowed with discretion. For intentional violators, there is no need for retesting nor is there need to retest vehicles that are obviously defective. Retest is recommended if no obvious defect exists or if the repair or replacement of the noisy element (like snow tires) obviously is not going to abate the noise.

SUMMARY OF FIELD MEASUREMENT PROCEDURES

1. Identification:

   Record time, date, operator, and site identification on the data sheet.

2. Are site conditions OK?

   a. Clear zone requirements met?

   b. Ambient sound level requirements met?

   c. Test site ground OK?

   d. Hard- or soft-site computations made?

   e. Reflecting objects considered?

3. Measurement Location and Site Layout:

   Sketch site layout and proximity to any major nearby sources (i.e., streets, air conditioner). Record all significant dimensions, topographic details, heights of source, presence of nearby reflecting surfaces and foliage (if significant, note density and type of growth). Also note ground cover in immediate proximity of measurement position and walls, fences, hedges, etc. between any major nearby source and measurement location. Be sure microphone height is correct.

4. Weather Data:

   Weather conditions:

   - No high winds?
   - No precipitation?

   The following weather information should be noted and recorded on data sheet:

   - Temperature
   - Relative humidity

     } Only if either approaches the limits of the range in which the manufacturer recommends use of the equipment.

   - Wind velocity
   - Any precipitation and water, ice, or snow on the pavement.

   If the measurement period is lengthy, note variations in weather data during the measurement period.

5. Source Activity:

Note general activity of major nearby noise sources (i.e., traffic flow, air conditioners operating, aircraft flyovers, etc.).

6. Basics of Sound Level Meter Operation:

(Refer to instruction sheet for specific meter type.)

a. Check batteries on meter and calibrator before each calibration.
b. Always calibrate before and after measurement (For long measurement periods, intermittent calibrations are appropriate).
c. Use windscreen.
d. Measure ambient noise level.
e. Measure source.
f. Fill out data sheet.
g. Recheck calibration.

7. Annual Calibration (suggested):

On an annual basis sound level meters and calibrators should receive a laboratory calibration in accordance with the manufacturer's specifications. This calibration should be traceable to the National Bureau of Standards.

An inspection label should be attached to each instrument set stating when and where the calibration was performed. This label is usually attached by the facility that calibrated the instrument.

8. Meter Settings:

For vehicle noise measurements, use A-weighted filtering and "fast" response.

9. Meter Scale --- Measurement Range:

Set attenuator so that readings are made as near mid-scale as possible. This insures maximum readability and minimizes chances of overloading the meter.

10. Avoid Wind Noise:

Always use a windscreen for outdoor measurements. Curtail measurements when the steady wind speed exceeds 12 mph. (Some jurisdictions permit measurements in winds with speeds up to 25 mph). An adequate wind speed meter can be purchased for less than $10.00.

11. Precipitation:

Do not conduct measurements when precipitation is falling.

12. Sound Level Meter Orientation:

The meter should be oriented as the manufacturer directs. Grazing incidence microphones require that the axis of the microphone be perpendicular to the line of sight from the source to the meter. Perpendicular incidence microphones require that the meter be pointed directly to the source. Refer to the instruction manual for the particular requirements of the sound measurement instrumentation being used.

MOTOR VEHICLE NOISE MEASUREMENT DATA SHEET

Date _____ Time Start Test _____

Sound Level Meter: Manufacturer _____ Model _____ Serial # _____
Microphone: Manufacturer _____ Model _____ Serial # _____
Calibrator: Manufacturer _____ Model _____ Serial # _____

Meter Check: Batteries OK? ☐ Windscreen attached? ☐
Fast response? ☐ A-weighting network? ☐

Weather:
Wind Speed _____
Calibrator Check: Batteries OK? ☐ Temperature _____
Humidity _____

Calibration at Start _____ dB at _____ hertz

Site Sketch

Indicate North

Site Location

_____
_____
_____

If prequalified site, indicate designation of site.

Calibration at End _____ dB at _____ hertz
Time End Test _____
Batteries in meter OK? ☐ yes ☐ no in calibrator OK? ☐ yes ☐ no

Equipment turned off ☐

Operator _____

VEHICLE MEASUREMENT SHEET

Date _____

Test No	Vehicle Type Identification	A-Weighted Sound Level, dB		
		Measured	Allowed	Ambient

Lane (Distance)	A-Weighted Sound Level Allowed, dB			
	Heavy Truck	Medium Truck	Car	Motorcycle
1 (nearest)	88	86	81	81
2	87	85	80	80
3	86	84	79	77
4 (farthest)	86	84	79	79

Operator _____

APPLICABLE NON-MOTOR VEHICLE REGULATIONS
(Sample)

Ordinance No. _____cont'd.

Sec. 16-139. NOISE DISTURBANCE PROHIBITED.

No person shall make, continue, or cause to be made or continued, except as permitted, any noise disturbance as defined in this subchapter, or any noise in excess of the limits for such noise established in this subchapter.

Sec. 16-140. MAXIMUM PERMISSIBLE SOUND LEVELS BY RECEIVING LAND USE: IMMEDIATE THREAT.

(a) Maximum Permissible Sound Levels. With the exception of sound levels elsewhere specifically authorized or allowed in this subchapter, the following are the maximum permissible sound levels allowed at or within the real property boundary of a receiving land use:

(1) Table 1. SOUND LEVELS BY RECEIVING LAND USE

Zoning Category of receiving land use	Time	Sound Level Limit, dBA
R-1 to R-6 Residential	7 A.M. to 10 P.M.	60
	10 P.M. to 7 A.M.	50
C-0, C-1 to C-4, U-1 Commercial	At all times	65
M-1 to M-3 Industrial	At all times	75
Noise Sensitive Area	At all times	55
U-1 Flood Plain or FW Floodway	At all times	Use specific limit from above in view of character of land-use

STATIONARY NOISE MEASUREMENT DATA SHEET

Examiner:_____ Date:_____ Time:_____

Address: _____

Noise Source:_____ Address:_____

Type of Receiving Property: Residential ☐ Commercial ☐ Industrial ☐
Complainant:_____ Address:_____

Sound Level Meter Manuf:_____ Calibrator Manuf:_____ Micro. Manuf:_____
Type:_____ Type:_____ Type:_____
Serial #:_____ Serial #:_____ Serial #:_____

Meter check: Batteries OK? ☐ Windscreen ☐ A-Weighting ☐ ☐Fast ☐Slow Response Calibration Pretest____dB Posttest____dB

Test Conditions: General Weather Conditions_____ Wind Velocity_____

Test No.	Measurement Location	dB(A)
1	Ambient Noise	

Sketch of Site
(Indicate measuring locations, North direction, and appropriate distances).

GLOSSARY OF TERMS

(as used by the U.S. Department of Transportation Bureau of Motor Carrier Safety)

A-WEIGHTED SOUND LEVEL — the sound level observed on a standard level meter when using the A-weighting network included in the circuitry.

A-WEIGHTING NETWORK — an electronic circuit in a sound level meter which provides a frequency response in accordance with the standard characteristic response called "A".

ABSORPTION — a property of materials or surfaces that reduces the amount that an incident sound wave is reflected back into the air.

ACOUSTICS — the science of sound, including its production, it transmission, and the effects of sound waves.

AMBIENT SOUND LEVEL — the noise associated with a given environment, exclusive of a particular noise being tested, being usually a composite of sound from many sources near and far, exclusive of intruding noises from isolated identifiable sources.

ATTENUATION — the reduction or dissipation of sound energy resulting, for example, from a silencing device or an increase of distance from the source.

AUDIO FREQUENCIES — the frequency of a sound wave that is within the normal range of hearing, usually from 20 to 20,000 Hz (hertz or cycles per second).

BROADBAND NOISE — noise with energy content over a wide range of frequencies, usually with no predominant tonal characteristics. (Air hoses and waterfalls are examples.)

CALIBRATOR (ACOUSTICAL) — a device for producing a known sound pressure on the microphone of a sound level measurement system.

DECIBEL — the unit of sound pressure level or sound level; the symbol is "dB".

DYNAMIC CHARACTERISTIC (SOUND LEVEL METER) — a standard response speed of the indicator (meter needle) on a sound level meter; "fast" and "slow" are usually included on a sound level meter.

FAR FIELD — the sound field at a sufficient distance from a source so that the sound pressure level obeys the inverse-square law; usually, the distance is about twice the major dimension of the source or more.

FREE FIELD — a sound field in which sound is free to propagate without the effects of obstacles, reflecting surfaces, and boundaries.

FREQUENCY — the number of times a second that a sound wave, usually a pure tone, repeats itself; the basic unit was formerly called "cycle per second" or "cps" but is now called "hertz", for which the symbol is "Hz".

FREQUENCY RESPONSE — the output signal or level of an instrument or circuit resulting from an input signal of constant level and varying frequency.

HARD SITE — a sound measurement location at which the ground surface within a specified measurement area is primarily hard-surfaced or reflective.

INVERSE-SQUARE LAW — a description of acoustic wave behavior in which the mean-square pressure varies inversely with the square of the distance from the source; this behavior usually occurs in free-field situations, so that the sound pressure level decreases 6 dB with each doubling of distance from the source.

MICROPHONE — an electroacoustic transducer; a device that responds to sound pressures and produces an electrical signal.

NEAR FIELD — the sound field very close to a source, where the sound pressure does not obey the inverse-square law; see "far field".

NOISE — an undesirable or unwanted sound.

NOISE LEVEL — a term sometimes used for "sound level" when the implication of "noise" is intended.

NORMAL INCIDENCE — a condition in a sound field where the direction of sound waves impinging on a microphone or surface is at right angles (normal) to the microphone diaphragm or the surface.

PLANE WAVE — a sound wave where the wave fronts are parallel and at right angles (normal, or perpendicular) to the direction of wave travel.

POINT SOURCE — a simple sound source that radiates sound energy uniformly in all direction; also, a sound source that is small in relation to the wave length of the sound or to the measurement distance.

PURE TONE — a sound wave whose waveform is a simple sine wave, or a sound sensation characterized by a single pitch.

RANDOM INCIDENCE — a condition in a sound field where the direction of sound waves impinging at a given point is random.

REFLECTION — a property of materials or surfaces that makes the material or surface impervious to sound waves, so that the sound energy of an incident wave is returned to the air; see "absorption".

REFRACTION — a bending of the direction of travel of sound wave from its established path, caused, for example, by wind, a barrier, or a temperature gradient.

REVERBERANT FIELD — a sound field in which sound is significantly affected by obstacles, reflecting surfaces, and boundaries, and thus in which sound is characterized by multiple echoes; the opposite of "free field".

REVERBERATION — the persistence of sound in an enclosed space, resulting from multiple echoes or reflections.

ROOT-MEAN-SQUARE (RMS) — a term describing the mathematical process to determine an "average" value of a complex signal.

SOFT-SITE — a sound measurement location at which the ground surface within a specified measurement area is primarily absorptive, such as grass.

SOUND — an oscillatory fluctuation of pressure in air; the auditory sensation caused by such a fluctuation.

SOUND LEVEL — a weighted sound pressure level, determined by using a standard sound level meter with a specified weighting network included in the circuitry; usually, the use of the A-weighting network is implied if no other weighting is noted.

SOUND LEVEL MEASUREMENT SYSTEM — any instrument or group of instruments that provides an indication of the sound level occurring at the input transducer.

SOUND LEVEL METER — an instrument comprised of a microphone, amplifier, weighting network, and output meter that is used for the measurement of sound; the performance of a sound level meter is in accordance with the requirements of the American National Standard Specification for Sound Level Meters, S1.4-1971.

SOUND PRESSURE — the oscillatory fluctuations in atmospheric pressure that are caused by the passage of a sound wave.

SOUND PRESSURE LEVEL — 20 times the logarithm of the ratio of the root-mean-square value of a sound pressure to a reference sound pressure (20 micropascals) in decibels (dB).

SPECTRUM — a description of the frequency content of a sound; a range of frequency components with some common characteristic, such as "fan noise spectrum".

SPEED OF SOUND — the rate at which a sound wave travels; in air, it is 1127 ft/sec (344 m/sec) at an air temperature of 68°F (20°C).

SPHERICAL DIVERGENCE — propagation of spherical waves such that the intensity of the wave obeys the inverse-square law.

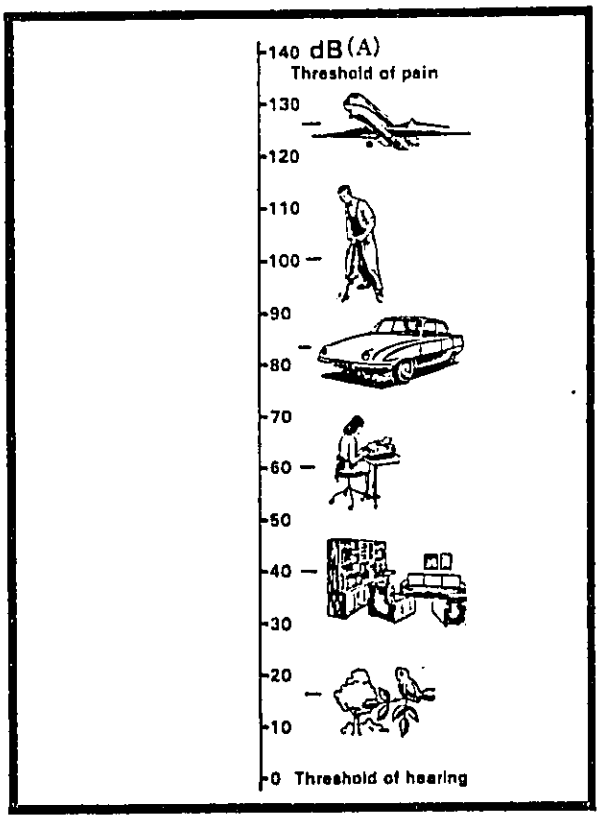
SPHERICAL WAVE — a sound wave where the wave fronts are concentric spherical surfaces, such as from a point source in a free field.

WAVE FRONT — an imaginary surface of a sound wave as it travels through the atmosphere.

WAVELENGTH — for a periodic wave (such as sound in air), the distance between identical location on two successive waves; it is inversely proportional to the frequency of the waves.

WINDSCREEN — a porous device to cover the microphone of a sound level measurement system, intended to minimize the effects of winds and wind gusts on the sound levels being measured; typically made of reticulated (open cell) polyurethane foam and spherical in shape.

SOUND LEVELS OF TYPICAL NOISE SOURCES



SOUND LEVEL AS A FUNCTION OF DISTANCE FOR A SMALL SOURCE

Distance Increase Factors	Sound Level Decrease		Distance Decrease Factor	Sound Level Increase
1	0.0		1	0
1 1/2	- 3.5		2/3	+ 3.5
2	- 6.0		1/2	+ 6.0
2 1/2	- 8.0		2/5	+ 8.0
3	- 9.5		1/3	+ 9.5
3 1/2	- 10.9		2/7	+ 10.9
4	- 12.0		1/4	+ 12.0
4 1/2	- 13		2/9	+ 13.0
5	- 14		1/5	+ 14.0
5 1/2	- 14.8		2/11	+ 14.8
6	- 15.6		1/6	+ 15.6
6 1/2	- 16.3		2/13	+ 16.3
7	-16.9		1/7	+ 16.9
7 1/2	- 17.5		2/15	+ 17.5
8	- 18		1/8	+ 18

Example:

At 50 feet the sound level is 87 dBA.

What is the sound level at 100 feet? The distance increase factor from 50 feet is 2, so 87 - 6 = 81 dBA.

What is the sound level at 300 feet? The distance increase factor from 50 feet is 6, so 87 - 15.6 = 71.4 dBA.

What is the sound level at 20 feet? The distance decrease factor from 50 feet is 2/5 so 87 + 8 = 95 dBA.

What is the sound level at 25 feet? The distance decrease factor from 50 feet is 1/2, so 87 + 6 = 93 dBA.

ADDITION AND SUBTRACTION OF SOUND LEVELS

Addition

When one wishes to add two sound levels, which are described in decibels, one uses a table of values, because decibels are logarithmic quantities and cannot be added according to the rules of ordinary arithmetic. To add two sound levels A and B, proceed as follows:

(1) Subtract the smaller level from the larger, A - B

(2) Use this difference in Table 1 below, and read off the addition term, T.

(3) Add the addition term to the larger sound level, A + T.

This value, A + T, will be the sound level which results from adding the two levels, A and B.

For example, suppose two chain saws which produce sound levels of 86 dB(A) and 83 dB(A) at 100 feet are brought together. Their combined level can be calculated by (1) subtracting 83 from 86 to get 3, (2) entering the table with 3 to find the addition term, 1.5, and (3) adding 1.5 to 86 to yield 87.5 dB(A), the sound level at 100 feet of the two chain saws operating together.

When more than two levels must be combined, add them one at a time, starting with the smallest. Thus, A + B + C + D is done A + B, then (A + B) + C, and finally $\left[(A + B) + C \right]$ + D. (See example (d) below.)

Other examples:

(a) What is the combined level from two sources, each of 85 dB? The difference is zero so the addition term is 3, and the combined level is 85 + 3 = 88 dB.

(b) What is the combined level of an ambient of 75dB and a source with a level of 80 dB? The difference is 5, the addition term is 1, and the combined level is 80 + 1 = 81 dB.

(c) What is the combined level of two sources with levels of 70 dB and 80 dB? The difference is 10, the addition term is zero, and the combined level is 80 + 0 = 80 dB. (This is the calculation behind the rule that measurements should be made when the ambient noise level is 10 dB less than the noise limit; the ambient then will not contribute to the overall sound level.)

(d) What is the combined level of three sources with levels of 68 dB, 71 dB, and 72 dB? The difference between the first two levels is 71 - 68 = 3 and the addition term is 1.5, so the combined level of the first two sources is 71 + 1.5 = 72.5 dB. The difference between this level and the third level is 72.5 - 72 = 0.5, and the addition term is 3, so the combined level of all three sources is 72.5 + 3 = 75.5 dB.

Difference Between the Sound Level of the Two Sources		Addition Term, T (add to the larger level)
Equal to or greater than,	but less than	(Values are approximations)
0	1	3
1	2	2.5
2	3	2
3	5	1.5
5	7	1
7	10	0.5
10	-	0

Table 1: Addition of Sound Levels

Subtraction

Sound levels are subtracted in a manner similar to that used for addition. To subtract one sound level B from another sound level A, proceed as follows:

(1) Subtract the smaller from the larger, A - B.
(2) Use the difference in Table 2, and read off the subtraction term, S.
(3) Subtract the subtraction term from the larger sound level, A - S.

The value A - S will be the sound level which results from subtracting sound level B from sound level A.

In practice, the larger level is always the combined level of two or more sources of the same or different kinds.

For example, if one has two snowmobiles which produce a combined level of 92 dB at 100 feet, and one of them is known to produce a level of 88 dB by itself at that distance, what will the level of the other one be alone? Subtracting 88 from 92 leaves 4 and the table shows that the subtraction term is 2. The larger value, 92 dB, minus the subtraction term leaves 90 dB. Thus 90 dB is the sound level at 100 feet from the second snowmobile.

As another example, suppose the ambient noise level is 75 dB before an air compressor is turned on, and that the sound level is 81 dB after it is turned on. What is the noise level of the air compressor? 81 - 75 = 6. The table shows that the subtraction term is 1. 81 - 1 = 80 dB, which is the noise level of the air compressor.

Other examples:

(a) What is the level that results when a source with a level of 80 dB is removed from a combined level of 85 dB? The difference is 5, the subtraction term is 1.5, so the resulting level is 85 - 1.5 = 83.5 dB.

(b) What is the level that results when a source with a level of 81 dB is removed from a combined level of 90 dB? The difference is 9, the subtraction term is 0.5, so the resulting level is 90 - 0.5 = 89.5 dB.

Difference between the Sound Level of the Combined Sources and the Level of One Source		Subtraction Term, S (subtract from the combined level)
Equal to or greater than,	but less than	(Values are approximations)
0	1	more than 6*
1	2	between 6 and 5*
2	3	between 4 and 3*
3	4	3
4	5	2
5	6	1.5
6	7	1
7	8	1
8	9	0.5
9	10	0.5
10	11	0.5
11	-	0

Table 2: Subtraction of Sound Levels

*Because of the uncertainties in the levels which are calculated from using these subtraction terms, law enforcement based on sound level differences of less than 3 dB may be unwise.

SAMPLE COURTROOM TESTIMONY

NOTES

Questions from Prosecutor and Testimony of Noise Enforcement Officer

1. *Noise Control Officer called to the stand.*

2. State name and occupation: Susan Redford, Police Officer.

   Were you so employed on the date of July 31, 1978? Yes.

   Where were you working on or about 6:00 p.m. on that date? At the site we call "A" located on Hamilton Street between 14th and 15th Avenues.

   Is that in the City of Allentown? Yes.

3. *Establish a competent witness:*

   What training, instruction, or experience have you had that qualifies you to use noise monitoring equipment? I have had 16 hours of formal training in the operation of sound level meters and the measurement of motor vehicle and stationary noise and I have in my possession a certificate attesting to that fact.

4. Serving in that capacity, what did you do? I issued a summons to John Bersford Tipton, operator of a 1972 Brown Rambler American.

5. Can you now identify the person to whom you issued the summons? Yes.

6. Is he in the court? Yes. Please point out the individual to the court. (Point out.)

7. In your own words, describe the events of that date leading to the issuance of said summons.

   I was on routine noise monitoring duty that evening observing traffic northbound on Hamilton Street in the 1400 block.

   I had issued two summonses prior to the one in question. I was using equipment manufactured by GenRad which meets the requirements of Regulation Title 67, Chapter 450.

The equipment was set up using the criteria established in the ordinance (enter into evidence). This establishes the basis for technical accuracy in monitoring with our equipment.

The microphone location was at a distance of 50 feet from the centerline of travel. Wind was less than 2 mph as measured before and after test. A windscreen was used and I held the sound level meter in accordance with the manufacturer's instructions. I could see that the sound level meter indication was determined when the vehicle was in the measurement area and that the vehicle was responsible for the meter indication observed.

8. What type of calibration is performed on this equipment to ensure its accuracy?

Two types:

Field Calibration: *(Described on procedure sheet)*

This procedure is performed on set-up and shut-down only of the monitoring equipment that is used. A known and calibrated sound source is used to produce a known sound level at the microphone, permitting the system to be adjusted to display the known sound level reference. This verifies that the system is recording the sound level accurately.

System Calibration:

This is a calibration procedure which is performed by a certifying laboratory. The equipment is calibrated by the factory using ANSI methodology against standards traceable to those at the National Bureau of Standards. Accuracy and proper operation of the equipment are certified at these lab facilities. Our equipment is calibrated in this manner every ___ days.

(Enter calibration certification into evidence).

Note: Some jurisdictions use 180 days, others use 365 days.

9. Was the equipment in field calibration and was the system calibration in effect and current on the date of issuance of the summons in question? Yes.

10. In your observation of the vehicle in violation, did you note the presence of any other noisy vehicles at that time? None. And there was a 6 dB swing between the vehicle in question and the preceeding and succeeding automobiles. This permits our meter to respond to the level of the vehicle under observation.

11. What was the ambient level observed at that time? 52 dBA.

12. Is this level at least 10 dB under your enforcement level? Yes.

Note: This is dependent upon requirements specified in regulation or enforcement test procedure.

13. What effect, if any, would the observed ambient level have on your reading of the vehicle in violation? An ambient of 10 dB under the maximum permitted ordinance level would contribute less than .5 dB to the reading if the vehicle emitted noise at the maximum permissible level. More than 10 dB down would contribute even less; and would be functionally negligible in the final reading.

14. Did you note any other noise sources that could have caused an erroneous reading on the vehicle in violation? None.

15 Were there any reflecting surfaces near your monitoring location that would induce an error in your reading? None.

16. According to the monitoring procedure established in Pennsylvania State Regulation Title 67, Chapter 450, for collection of evidence of a vehicular noise violation, is your observation of this vehicle an accurate one? Yes.

17. What was the allowable speed limit on Hamilton Street at your measuring location? The speed limit was 25 mph.

18. Describe the site. The measuring site which we have approved for measurements is called Site "A". It meets the requirements for a soft site as per Parts 1 and 3 of the State Regulation.

19. What was the reading observed on the vehicle in question? 86 dBA.

20. Is that in violation of the Pennsylvania state noise regulation levels for vehicles of this class? Yes.

21. By how many decibels? 4 decibels.

22. Are there any other conditions of the collection of this evidence that should be noted? No.

23. After observing the excessive reading, did you issue a summons to the driver of the vehicle in question? Yes.

24. What did you observe? The vehicle was not equipped with a muffler in its exhaust system.

25. On visual confirmation of the equipment of this vehicle's exhaust system, is there any doubt in your mind that this vehicle was the source of the noise observed in violation? None.

Note: It may be desirable to show the judge the equipment and its dynamic range to illustrate the ease of interpretation of the noise reading observed. (Especially in the case of the digital capture on the GenRad 1981, if used). If you have equipment difficult to interpret or read, this is not a good idea.

WORKSHOP

ON

POLICE ENFORCEMENT OF NOISE REGULATIONS

Evaluation Sheet

Date of Workshop: _____

We are very interested in your opinions on the content, conduct, and usefulness of this course. To help us improve future courses, please fill in the information below.

Your Job Description or Title: _____

Please rate each of the items below by CIRCLING the appropriate number.

Stated goals of the course:
Not Achieved: 1 2 3 4 5 6 7; Exceeded

Your personal expectations for the course:
Not Achieved; 1 2 3 4 5 6 7; Exceeded

Your personal involvement in the course process:
Shallow; 1 2 3 4 5 6 7; Deep

Relevance of program content to your work:
Irrelevant; 1 2 3 4 5 6 7; Highly Relevant

Complexity of the course material:
Too Simple; 1 2 3 4 5 6 7; Too Complicated

Course content:
Insufficient Theory; 1 2 3 4 5 6 7; Too Much Theory

Program format:
Poor; 1 2 3 4 5 6 7; Excellent

Audio/visual aids:
Generally Unhelpful; 1 2 3 4 5 6 7; Generally Very Helpful

Arrangements (i.e., catering, facilities, etc.):
Poor; 1 2 3 4 5 6 7; Excellent

Instructors' shared knowledge of subject:
Poor; 1 2 3 4 5 6 7; Excellent

Instructors' teaching techniques:
Ineffective; 1 2 3 4 5 6 7; Highly Effective

Overall, I would rate this workshop:
Poor; 1 2 3 4 5 6 7; Excellent

By taking this course, do you think you now have an adequate understanding of:

		YES	NO
1.	The principles of sound and noise?	_____	_____
2.	How to operate noise measurement equipment?	_____	_____
3.	Noise measurement techniques?	_____	_____
4.	Types of complaints that may arise?	_____	_____
5.	Legal aspects of noise enforcement?	_____	_____
6.	How to enforce motor vehicle noise regulations?	_____	_____
7.	How to enforce stationary noise regulations?	_____	_____
8.	If you asked specific questions, were they answered satisfactorily?	_____	_____

If we had a chance to hold this course again, what changes would you recommend to improve it?

I would not make any changes ( ).
I would change:

WORKSHOP ON POLICE ENFORCEMENT
OF NOISE REGULATIONS

Name_____

Date_____

EXAM — PART I

Time Allowed, 15 minutes, "Open Book"

1. Define "noise" _____

_____

2. Circle the one characteristic that does not relate to sound: intensity, frequency, loudness, force, pressure, duration

3. We describe "sound pressure level" by 1) decibels ( ), 2) hertz ( ), 3) cycle per second ( ).

4. The sound level of an automobile, when measured at 50 feet, is approximately 10 ( ), 40 ( ), 70 ( ), 100 ( ), or 120 ( ) dBA.

5. A pure tone is
   a) a sound at a single frequency
   b) a measure of hearing
   c) a sound level
   d) a measuring instrument

6. Match the types of noises by drawing lines from source to type of noise.

a)	steady	electric fan
b)	impulse	electric razor
c)	slowly fluctuating	aircraft passing
		hammer

7. Circle the frequency weighting scale that is most widely used for community noise: A, B, C, FLAT

8. Why is this weighting scale used?
   a) measures more accurately
   b) it is easier to use
   c) it approximates human hearing
   d) none of the above

9. If we measure something using the A-scale, we say the sound level is: X dBA ( ), X decibels ( ), X hertz ( )

10. Which components are not part of most sound level meters?
   a) Weighting switch
   b) Amplifier
   c) Windgauge
   d) Acoustical Calibrator
   e) Meter response switch

11. Combine sound levels of 50 dB and 50 dB
Approximate Answer:100 dB, 25 dB, 75 dB, 53 dB

12. Subtract a sound level of 80 dB from a combined level of 100 dB
Approximate Answer: 100 dB, 20 dB, 53 dB

13. What factors affect the motor vehicle noise levels at a particular location?
    a) distance
    b) barriers
    c) ambient noise level
    d) all of the above

14. Can you cite violators if the measurement is made while is raining?

    Yes _____ No _____.

WORKSHOP ON POLICE ENFORCEMENT

OF NOISE REGULATIONS

(Specifically prepared for Pennsylvania)

Name_____

Date_____

Exam — PART II

Time allowed, 15 minutes, "Open Book"

16. What don't the Penn DOT Noise Regulations apply to:
    a) Snowmobiles
    b) Fire equipment
    c) Ambulances
    d) Four-wheel drive vehicles

17. Would hard packed dirt be considered a "soft site?" Yes___, No___

18. Give an example of the type of vehicle for which the reference point would not be the front of the vehicle.
    a) Motorcycle
    b) Station wagon
    c) "Greyhound" bus
    d) Semi-tractor
    e) All of the above

19. What is the maximum noise limit at 50 feet allowed for a passenger automobile when measured in a 50-mph speed zone and on a soft site? 76, 78, 82, 86, 88

20. Motor vehicle noise limits apply to (check those that apply)
    a) Motorscooters
    b) Busses
    c) Riding mowers
    d) Garbage trucks while compacting
    e) Garbage trucks while moving

21. What is the "maximum" measurement tolerance allowed? 0.3 dB, 1 dB, 2 dB, 10 dBA, 1000 Hz.

22. Can an officer cite a driver for "tire peeling?" Yes___, No___

23. Is there anything stopping you from measuring noise after a stop sign or toll booth?
    a) Yes, if there are reflecting surfaces near by or there are a lot of vehicles in the measuring area.
    b) No, if the toll booths are in a clear zone and the measurements are performed according to the regulations.
    c) All of the above.

24. Can you use a Type I meter for motor vehicle noise measurements?
Yes____, No____

25. Do you have to calibrate it before every vehicle measurement?
a) Yes
b) No, but if you have the time, it can't hurt

26. Should you use the windscreen if the steady wind is under 12 miles per hour?
a) Yes
b) No - the measurements are not valid

27. Can there be snow on the ground when you measure — if the lane of travel is dry? Yes____, No____

28. How much lower than the noise limit must the ambient noise level be?
a) 2 dB
b) 6 dB
c) 10 dB

29. You use A-weighted filter and fast response. True____, False____

30. If you measure closer than 50 feet, the allowable limit will be
a) Greater than that at 50 feet
b) Less than that at 50 feet
c) The same as that at 50 feet

Allentown Police Academy

Allentown, Penna.

This Is To Certify That

[redacted]

Has satisfactorily completed a training course in

NOISE MEASUREMENT AND ENFORCEMENT

Sponsored by the Bureau of Police, Allentown, Penna.
held at the Allentown Police Academy

Date [redacted]

Signature
DIRECTOR—SERVICES AND TRAINING

C. O. Police
CHIEF OF POLICE