

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division	NUMBER IH96650
	REVISION FINAL rev1
INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure	DATE 07-12-04
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SUBJECT: INSTRUMENT OPERATION:	
Quest Q-300 Noise Dosimeter	

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**Model
Q-300
Noise Dosimeter**



1.0 Purpose/Scope

This procedure provides a standardized method for the operation of the Quest Q-300 Personnel Noise Dosimeter. It should be used in conjunction with the SBMS Subject Area Noise and Hearing Conservation and IH SOP IH96300: *Noise Measurement Principles: Noise Dosimetry*.

Employee exposure assessments for regulatory compliance should be made with a noise dosimeter, such as the Q-300. Employees wear dosimeters as they move through the work area. The dosimeter logs a close representation to the actual noise exposure of the ear as the distance from the source changes with employee movements. The logged exposure data is compared to occupational exposure limits to determine compliance with hearing conservation regulations. The logged data provided by the Q-300 includes both OSHA and ACGIH records by pre-determined settings.

The Quest Q-300 Noise Logging Dosimeter is a microcomputer-based sound analyzing instrument for accumulating, displaying, and sending data to serial or parallel printers or computers. The Q-300 can function as a personal noise dosimeter, an area monitor or a survey event monitor. While the Q-300 can be used as a survey meter, other SPL meters designed as precision area survey meters offer more features (such as impact/ impulse capturing) and should be used for area surveys.

2.0 Responsibilities

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- 2.1 Use of the Q-300 shall be limited to persons who act under the direction of a competent hazard assessment person and have demonstrated the competency to satisfactorily use the meter, as evidenced by experience and training, to the satisfaction of their supervision or existing qualification criteria set by their organization.
- 2.2 Personnel that perform exposure monitoring with this instrument are responsible to follow all steps in this procedure.
- 2.3 The data collected using this meter must have an appropriate evaluation of the hazard and risk by a knowledgeable Industrial Hygiene professional.

3.0 Definitions

CL: Criterion Level; The constant sound level in dB that, if applied for 8 hours, would accumulate a DOSE of 100%. (Used in Dose measurements.)

dB: *Decibel*: A non-dimensional unit used to express sound pressure levels. It is the log of the ratio of the measured sound pressure level to a reference level.

*dB**A*: A sound pressure level in decibels made on the A-scale of a sound level meter. This unit of measure approximates the response of the human ear.

*dB**C*: Sound pressure based on a nearly flat, non-weighted scale.

DOSE: A percentage of the maximum allowable noise that a worker can be exposed to per day. This is a computation that is based on the following variables: Criterion Level (CL), Lower Threshold (LT), and Exchange Rate (ER).

ER: Exchange Rate; The number of decibels that a sound must change to either halve or double the rate of dose accumulation. (3, 4, 5 or 6 dB exchange rates are common.)

LAVG: The average sound level, in decibels, for the measurement period based on a 4, 5, or 6 dB Exchange Rate (ER). If the ER is 3 dB, then LAVG becomes LEQ.

LEQ: Equivalent Continuous Sound Level; The average sound level for the measurement period based on a 3 dB ER. If the ER is 4, 5, or 6 dB, then LEQ becomes LAVG.

Occupational Exposure Limit: The maximum time weighted average (TWA) exposure permitted for employee exposure, based on the lesser of the OSHA Permissible Exposure Limit

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(PEL) or ACGIH Threshold Limit Value (TLV). See IH96300.

SEL: Sound Exposure Level; The constant sound level in decibels which, if lasting for one second, would deliver the same amount of acoustical energy as that delivered over the entire measurement period.

TL: Threshold Level; A preset level in decibels below which sound is not accumulated or averaged into LAVG, LEQ or DOSE.

4.0 Prerequisites

4.1 Area Access:

- 4.2.1 Contact the appropriate Facility Support Representative or Technician to obtain approval to enter radiological areas, if applicable. Verify with the appropriate Facility Support Representative or Technician if a Work Permit or Radiological Permit is needed or is in effect. If so, review and sign the permit.
- 4.2.2 Use appropriate PPE for area, including hear protection if the area has not been characterized for noise exposure. Required training and medical approval must be completed prior to wearing PPE.

5.0 Precautions

5.1 Hazard Determination:

- 5.1.1 The operation of this dosimeter does not cause exposure to any chemical, physical, or radiological hazards. The meter design does not cause significant ergonomic concerns in routine use.
- 5.1.2 The dosimeters do not generate Hazardous Waste.
- 5.1.3 By its very nature, noise dosimeters may be used in areas where excessive noise levels exist or are suspected to be present. Exposures to noise levels above the PEL and/or TLV may cause temporary or permanent hearing loss.

5.2 Personal Protective Equipment:

- 5.2.1 In areas where noise levels exceed the *Occupational Exposure Limit (OEL)*, hearing protection must be worn. The hearing protection should be able to reduce the noise levels below the OEL. See IH96300 for guidance on PPE

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selection.

5.2.2 Additional PPE: Other appropriate PPE for the area being entered. Check with your FS representative.

5.3 **Dosimeter Calibration:** Failure to calibrate the Quest Q-300 prior to and post use may result in an increased margin of error in the results. All field testers must verify a valid calibration status in accordance with Section 6.0.

6.0 Procedure

6.1 **Equipment:** (Pictured in Appendix 9.1)

6.1.1 Meter Body

6.1.2 Microphone and windscreen (foam cylinder)

6.1.3 Calibrator (Model QC-10/QC-20)

Windscreen on the
Microphone



6.2 **Start and warming up the Q-300** (picture of meter and description of controls and displays is contained in Appendix 9.1.)

6.2.1 **Turning the meter on:** Press *Menu/On/Off*

6.2.2 **LOBAT:** If the LOBAT light comes on, replace the batteries.

6.2.3 **Warm-up:** A warm-up is not required for this meter.

6.3 **Clearing Data from the Memory:** To calibrate and store the calibration data, the instrument must be cleared of data. To clear the memory, the instrument must be in *Pause* mode.

6.3.1 Press *Run/Pause* so *Pause* shows in the display.

6.3.2 Press *Menu/On/Off* key until “res5” is displayed.

6.3.3 Press and hold the *Enter* key for five seconds as the display counts down from “res5” to “res1”.

6.4 **Calibration of the Q-300** (picture of meter and description of controls and displays is contained in Appendix 9.1.)

6.4.1 **Calibration:** Slide the calibrator *Power Switch* to *On*. Check the battery indicator and replace batteries if necessary. Listen to hear if Calibrator is producing a tone.

6.4.2 Remove the windscreen from the microphone. Insert the dosimeter microphone into the calibrator adaptor.

6.4.3 Press *Levels* and use the arrow keys to set the Q-300 to

Microphone
inserted into
calibrator



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read SPL.

- 6.4.4 Observe the meter reading in dB. The reading should be the proper level = **114.0 +/- 0.5 dB**.
- 6.4.5 Press the **Menu/On/Off** key then the up arrow.
- 6.4.6 The CAL annunciator in the display will light, and the number in the display should match the output level of the calibrator. Press **Run/Pause** to begin the calibration routine. The display will read "CAL" and after a few seconds return to the previous CAL display.
- 6.4.7 When the CAL data is stored it will be included in the printout of each study. Also record the reading on the **BNL Noise Dosimeter Form**.
- 6.4.8 If the reading is not within calibration return the dosimeter to the IH lab and do not use.
- 6.4.9 Remove the microphone from the calibrator, turn off the calibrator and press **Menu/On/Off** to return to the ON screen. The meter is now ready to be used for monitoring.

6.5 Meter Operation:

- 6.5.1 Install the windscreen (foam cylinder) over the microphone.
- 6.5.2 Attach the microphone to the workers collar near the ear. Clip the meter to belt or place in a coat, suit, or pant's pocket. **IMPORTANT NOTE:** Unit should be on **Pause** to prevent the movement and handling of the microphone from being stored as noise exposure.
- 6.5.3 If **LOBAT** is displayed, replace the battery and continue.
- 6.5.4 When work is ready to begin, press **RUN/PAUSE** to begin logging noise exposure. **RUN** will be displayed.
- 6.5.5 You can separate the logging into "events" (such as before and after breaks for lunch) by pressing the **RUN/PAUSE** key. This will pause the instrument for events such as leaving for lunch. Press **RUN/PAUSE** again to begin a new event upon return to work. If taking the instrument off the worker, pause the monitor before removing it and start the monitor after repositioning the instrument on the worker. All events will be averaged together at the end to calculate a daily average and dose.
- 6.5.6 When monitoring is completed, press **RUN/PAUSE** to place the unit in pause mode. Turn off the unit by holding the **Menu/On/Off** key for five seconds. Data will be saved in the unit.



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- 6.5.7 Return the instrument to the IH lab. Post-calibrate the meter as per step 6.4. Record Cal data on *BNL Noise Dosimeter Form.*
- 6.5.8 Record all data on the *BNL Noise Dosimeter Form.* (Attachment 9.4). It is important to record what the worker was doing throughout the day with enough detail to correlate with the logged data.

6.6 Printing of Logged Data:

- 6.6.1 Print data directly from the instrument using the IH lab computer.
- 6.6.2 Connect the dosimeter directly to the serial printer via the multi-pin cable.
- 6.6.3 The printout will include a summary table for Dosimeters I, II & III. Dosimeter I readings are set for OSHA compliance and dosimeter II is set for ACGIH compliance. Data is not lost during printout.
- 6.6.4 **Printing a hardcopy report:** While in pause mode, press the *Menu/On/Off* key and **RES5** will be displayed. Press the **down arrow** key to display **Pm7**.
- 6.6.5 Press the **Run/Pause** key and **PrLL** will appear in the display and the print will begin.
- 6.6.6 When print is finished, review the printout to ensure accurate representation of the data.
- 6.6.7 Turn the unit off, remove the computer cable, replace the microphone on the unit and check the dosimeter back into the IH equipment database.

6.7 Documenting Sampling Data and Work Conditions readings:

- 6.7.1 Use the *BNL Noise Dosimeter Form* to record field events and information (Attachment (9.4).
- 6.7.2 Complete the *Employee Notification Form* (Attachment 9.5) and send a copy to the worker, the supervisor and the IH lab.
- 6.7.3 Enter data into the IH Noise Database.
- 6.7.4 Provide a copy of the printed data, the original *BNL Noise Dosimeter Form*, and the *Employee Notification Form* to the SHSD IH Laboratory Technician.

6.8 Results interpretation:

- 6.8.1 A competent person should write a hazard evaluation report that evaluates the survey data and summarizes the potential for occupational exposure and compliance with OSHA and ACGIH Occupational Exposure Limits.
- 6.8.2 Ensure that a copy of the hazard evaluation report is sent to the IH Laboratory and is included in the ESHQ Directorate Recordkeeping system.
- 6.8.3 Ensure that a copy of the written hazard evaluation report is sent to the Occupational Medicine Clinic with the worker's BNL Life Number noted.

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Note: The hazard evaluation report and/or an *Employee Notification Form* (Attachment 9.5) must be used to inform all monitored employees of the results of the monitoring and the implication to compliance with OELs. Reporting to employees should be within 15 days of monitoring.

7.0 Implementation and Training

Prior to using this meter, the operator of the dosimeter:

- 7.1 Demonstration of proper operation of this instrument to the satisfaction of the employee's supervision.
- 7.2 Other appropriate training for the area to be entered (check with ESH coordinator or FS Representative for the facility).
- 7.3 BNL Noise and Hearing Conservation OT&Q Training and a Baseline audiogram may be needed if the duration of exposure to the person performing the survey will be in excess of the OSHA Permissible Exposure Limit (PEL) or ACGIH Threshold Limit Value (TLV) (which ever is less). See IH96300.
- 7.4 For the SHSD IH Group personnel:
 - 7.4.1 Qualification on this JPM is required on a 3 year basis, providing the professional is monitoring noise sources frequently.
 - 7.4.2 Personnel are to document their training using the Attachment 9.5 with its *Job Performance Measure Completion Certificate* for this meter.
 - 7.4.3 This qualification is used in conjunction with the *Job Performance Measure Completion Certificate: IH Group Member NHC Hazard Assessor* from IH96120.

8.0 References

- 8.1 Quest Q-300 Instruction Manual 59-253 12/86.
- 8.2 BNL SBMS Subject Area Noise and Hearing Conservation
- 8.3 OSHA Noise/Hearing Conservation 29CFR1910.95.
- 8.4 NIOSH Criteria for a Recommended Standard-Occupational Noise Exposure, 1998.
- 8.5 ACGIH American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

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9.0 **Attachments**

- 9.1 Photo of meter and parts
- 9.2 Control Keys
- 9.3 Short List of Operating Instructions
- 9.4 Noise Dosimeter Field Data Form for Quest Q-300
- 9.5 Employee Notification Form
- 9.6 Quest -300 Dosimeter Qualification record

10.0 **Documentation**

Document Review Tracking Sheet		
PREPARED BY: <i>(Signature and date on file)</i> J. W. Peters Date: 11/14/2003	REVIEWED BY: <i>(Signature and date on file)</i> R. Selvey Date: 3-24-04	APPROVED BY: <i>(Signature and date on file)</i> R. Selvey IH Manager Date: 3/24/04
Filing Code: IH51QR.04	DQAR Date	Effective Date: 03/25/04

Periodic Review Record		
Date of Review	Reviewer Signature and Date	Comments Attached
07/12/04	<i>(Signature and date on file)</i> Robert Selvey	Added Attachment 9.6. Revised Section 7 on qualification.

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Attachment 9.1 Photo of the Meter and Parts



Model QC-10 Calibrator



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Attachment 9.2

Control Keys

Control Keys	
LEVELS	The LEVELS function key shows the current SLM readings. Move through the items (SPL, MAX, MIN or PEAK) using the arrow keys. Pressing LEVELS again selects the next dosimeter (I, II, or III) and displays the levels for that dosimeter.
MENU/ON/OFF	Pressing this key turns the meter on. After a warm up period of several seconds, the display will read "on" and the dosimeter is ready to use. Pressing and holding this key five seconds will cause the display to read "off"5" and count down for five seconds until "off" is displayed. After this the display will blank and you may release the key. Releasing the key will turn the unit off. Briefly pressing and releasing this key will toggle the display between 'on' and 'res5" (reset), when in the Pause mode.
ENTER	The ENTER key is used in the setup menu to begin and end a change of a menu item's value or state. After using the arrow keys to select a menu item, press ENTER to light the SET indicator, allowing the value to be changed with the arrow keys. After changing, press ENTER to store the value.
UP ARROW	Press to move upward through the menu
DOWN ARROW	Press to move downward through the menu
RUN/PAUSE	Press to toggle between Run Mode and Pause Mode. If the Q-300 is in the setup menu at either Cal or Prn, pressing this key will begin a calibration or start printing, respectively.
DOSE	The DOSE function key selects the group of items DOSE, PDOSE or EXP for display. Pressing the DOSE key again selects the next dosimeters (I, II, or III) dose group to be displayed.
AVERAGE	The AVG function key selects the group of items LAVG, TWA or SEL for display. Pressing the AVG key again selects the next dosimeters (I, II, or III) averages to be displayed.
TIME	The TIMES function key selects the group of items RT, PT, or UL (Run Time, Pause Time or Upper Limit Time) for display. Pressing TIMES again selects the next dosimeters (I, II, or III) times to be displayed.

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Attachment 9.3 Short Operating Instructions

Step		User Action
1	Power On	Press Menu/On/Off
2	Battery Check	Observe screen for warning LoBAT .
3	Warm-Up	A warm-up is not required for this meter.
4	Pre- Calibration	To calibrate and store the calibration data. Clear data. <ul style="list-style-type: none"> • Press RUN/PAUSE so Pause shows in the display. • Press Menu/On/Off key until "res5" is displayed. Press and hold the Enter key for five seconds as the display counts down from "res5" to "res1".
		<ul style="list-style-type: none"> • Slide the calibrator <i>Power Switch</i> to On. • Remove the windscreen from the microphone. Insert the dosimeter microphone into the calibrator adaptor. • Press Levels and use the arrow keys to set the Q-300 to read SPL. The reading should be the proper level (114.0 dB) within 0.5 dB.
		<ul style="list-style-type: none"> • Press the Menu/On/Off key then the up arrow. The CAL annunciator in the display will light, and the number in the display should match the output level of the calibrator. • Press Run/Pause to begin the calibration routine. The display will read "CAL" and after a few seconds return to the previous CAL display.
		Remove the microphone from the calibrator, turn off the calibrator and press Menu/On/Off to return to the ON screen.
		Press and hold Menu/On/Off and turn unit Off . The meter is now ready to be used for monitoring.
5	Dosimeter Set-up	Attach the microphone to the workers collar near the ear. Clip meter to belt. (Note: Unit should be OFF).
6	Operation	Press Menu/On/Off to turn unit on. To accumulate event Data: press RUN/PAUSE so that Run shows in the display.
		If you need to pause the event: press RUN/PAUSE so Pause shows in the display then again to start another run. During a run the display may show LO, which means the ambient noise level is below the threshold setting. This is normal for quiet areas.
7	Stop Logging	Press RUN/PAUSE to pause.
8	Power Off	Turn off the unit by holding the Menu/On/Off key for five seconds. Data will be saved in the unit.

**IH 96650 Attachment 9.4
Noise Dosimeter Data Form Q-300**

**(see next two page,
form is a two sided copy)**

Optional sketch of the Area

Additional Comments on the Job, Task, Hazard, etc.

V. CONCLUSIONS & RECOMMENDATIONS

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Attachment 9.5

Employee Notification Form

(see next page)

Environment, Safety Health & Quality Directorate - Industrial Hygiene Services

This Section to be completed by Sample Submitter		
Send results to Responsible Party:	Name: Building: <small>Responsible Party will be expected to notify workers of monitoring results within 15 working days</small>	
Send copy to:	Name:	Building:
Send copy to:	Name:	Building:
Send copy to:	Name:	Building:
Copy to IHG:	Name:	Building:

Notification to employee must be made by:	Date
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This Section to be completed by the Responsible Party before date above (within regulatory set time periods).		
Exposure in Compliance with Standards (ACGIH & OSHA)	or	Exposure exceeds Standards (ACGIH or OSHA)
Employee Notification Review of this data indicates exposure levels were IN COMPLIANCE with regulatory limits. The employees represented by this exposure monitoring were informed of the results by: Name: _____ Date: _____		Employee Notification Review of this data indicates exposure levels were ABOVE a regulatory limit. The employees represented by this exposure monitoring were informed of the results and corrective actions by: Name: _____ Date: _____

Note: When a formal BNL Memorandum is written, send a copy to the SHSD Industrial Hygiene Group (Building 120) and the Occupational Medicine Clinic (Building 490).

Return this form to the Industrial Hygiene Group (Building 120) as soon as employee notification is made.

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Attachment 9.6

Noise Dosimeter Q-300 Qualification Form

(see next page)

Noise Dosimetry with the Quest Q-300
Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:
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Practical Skill Evaluation: Demonstration of Evaluation Methodology by Oral Exam

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Hazard Analysis	Understands the need to perform a hazard analysis of the area and potential exposure to the self as sampler and workers in the area.			
2. Personal Protective Equipment	Understands the need to be aware of the potential surface contamination, airborne levels of contaminants, radiological hazards, and noise hazards. Knows how to determine the need for PPE.			
3. Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.			
6. Operating Parameters	Knows the theory to establish operating parameters (safety envelope) for the equipment.			
7. Documentation	Demonstrates correctly filling out IH monitoring forms.			

IH Noise Meter Operation - Practical Skill Evaluation: Demonstration of Methodology

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Turning the Meter On and Off	Demonstrates correctly activating the meter and turning it off			
2. Calibration of the Meter	Demonstrates correctly calibrating/bump checking the meter			
3. Clearing Stored data	Demonstrates the correctly to erase stored data			
4. Operation of taking a reading	Demonstrates correctly attach the meter to worker			
5. Downloading stored data	Demonstrates correctly extracting stored data from the meter to paper printout and electronic storage.			
6. Clearing data after downloading	Demonstrates correctly for removing stored data for the next user.			

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:
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I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date:
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