



MONARCH INSTRUMENT

Instruction Manual



Monarch 322 **Datalogging Sound Level Meter**



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Safeguards and Precautions



1. Read and follow all instructions in this manual carefully, and retain this manual for future reference.
2. Do not use this instrument in any manner inconsistent with these operating instructions or under any conditions that exceed the environmental specifications stated.
3. When making measurements in high noise environments, be sure to use proper hearing protection.
4. This instrument is not user serviceable. For technical assistance, contact the sales organization from which you purchased the product or Monarch Instrument directly.

LIMITED WARRANTY

SELLER warrants hardware products to be free from any defect in materials or workmanship for a period of one (1) Year from date of shipment to BUYER. SELLER's entire liability and BUYER's sole and exclusive remedy resulting from any defect in workmanship or material in the hardware product covered by this limited warranty shall be limited to and fully discharged by the SELLER's option of replacement or repair of such item without charge. The limited warranty provided in this clause is in lieu of all other warranties, expressed or implied, arising by law or otherwise. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED. This limited warranty shall not be modified except by an arrangement signed by both parties specifically referencing this clause.

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This limited warranty does not extend or apply to consumables (including, but not limited to, lamps and batteries, if applicable) or equipment, instruments or accessories which are warranted separately by the original manufacturer of these items.

DECLARATION OF CONFORMITY

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Monarch Instrument
Division of Monarch International Inc.
15 Columbia Drive, Amherst NH 03031 USA

declares that the product:

Name: Sound Level Meter
Model: Monarch 322

to which this declaration relates is in conformity with the following standards:

EMC: EN55011/1991 Class B
EN50082-1/1997 / EN61000-4

and therefore conforms in accordance with 89/336/EEC-EMC Directive. The testing of this product was performed by GesTek EMC Lab. in March of 2001. (Ref. No. 0102072E).

14th March 2001
Importer (Amherst, NH)


Alan Woolfson, VP Engineering (Authorized Signature)

1.0 Introduction:

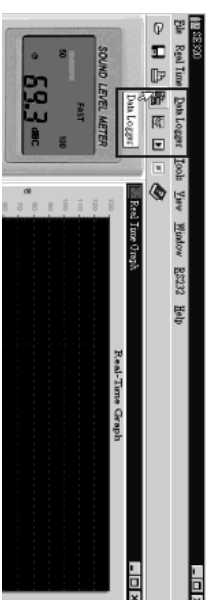
This instrument is a Type 2 Datalogging Sound Level Meter intended for general-purpose measurements of sound pressure levels in industrial and environmental applications. It is equipped with A and C frequency weighting and Fast and Slow time weightings. It is autoranging over the range of 30 to 130 db and complies with IEC651 Type 2 and ANSI S1.4 Type 2 standards. It is provided with both an AC output of 0-1Vrms over the full scale of the range selected and a DC output of 10mV/dB. It has an internal data storage capability of 32,000 records and is equipped with a RS232 interface for bi-directional communication with a PC.

2.0 Specifications:

Standard Compliance:	IEC651 Type 2, ANSI S1.4 Type 2
Measurement range:	30 - 130dB
Dynamic range:	50 dB
Scale Ranges:	Low: 30 - 80dB Medium: 50 - 100 dB High: 80 - 130 dB Auto: 30 - 130 dB
Frequency range:	31.5Hz - 8KHz
Frequency weighting:	A, C
Time weighting:	Fast (125ms), Slow (1 sec.)
Microphone:	1/2 inch electret condenser microphone
Digital display:	4 digits
Resolution:	0.1dB
Update Rate:	0.5 sec.
Analog display:	50 segment bargraph
Resolution:	1dB
Update Rate:	50ms
Accuracy:	±1.5dB (under reference conditions, 94dB @ 1KHz)
Out of Range Indication:	Displays 'OVER' when over range for bargraph scale selected Displays 'UNDER' when under range for bargraph scale selected Displays '-LO.' when under range by at least 20 dB Maximum and Minimum RMS value hold
MAX/MIN hold:	32,000 records
Internal memory:	Bi-directional RS232. Software and cable included
Digital output:	0 - 1Vrms over scale range selected
AC output:	Approx. 100 Ω output impedance 10mV/dB
DC output:	Approx. 1 KΩ output impedance
Power requirement:	9 Volt battery, NEDA 1604 or JIS 006P or IEC 6F22
Battery life:	Approx. 50 hours with alkaline battery. Low battery indication
Operating Conditions:	<ul style="list-style-type: none"> Operating Temperature and Humidity: 0°C - 40°C (32°F - 104°F); 10 - 90% RH Non-condensing Storage Temperature and Humidity: -10°C - 60°C (14°F - 140°F); 10 - 75% RH Non-condensing
Dimensions:	Altitude up to 2000 meters (6500 feet) 275x64x30mm (10.8x2.5x1.2 in)
Weight:	Approx. 285g (10.0 oz)
Accessories:	Windscreen, Battery, Carrying Case, 3.5mm Plug, Screwdriver, Instruction Manual, Software, RS232 Cable
Option:	AC Adaptor: 9Vdc (8-15Vdc Max.) @ 30mA, 3.5mm (+), 1.35mm (-)


8.2 Downloading Stored Data to PC

Recorded data internally stored in the sound level meter may be downloaded directly to a PC by connecting the instrument to the PC with the RS232 cable supplied. Further instructions and information for downloading data and subsequently working with these data are described in Section 7.9, Datalogger. In the event of failure to properly connect, see Section 8.4 below.



8.3 Recording in Real Time to the Computer

Power on the sound level meter. Then connect it to the PC with the RS232 cable provided and start the Testlink program. In the 'View' drop down menu, select both 'Control Panel' and 'Real Time Graph' to be displayed. If the connection is successful, the information displayed on the instrument panel on the PC will be the same as that on the actual sound level meter display, and the buttons on the PC panel may be used to control the actual instrument. In the event of failure to properly connect, see Section 8.4 below.

When the connection is successfully completed, click  to start recording. A 'Real-Time Setup' menu will appear to select the total number of samples to be taken and the sampling rate. As these selections are made, the 'Recording Period' will be updated and displayed. When the desired conditions are set, click 'Start' to begin recording. The real time measurement of sound pressure level will graph on the display at the sample rate selected.


To terminate real time recording prior to completion of the duration selected, click .

8.4 Failure to Achieve a Connection

When establishing a connection between the sound level meter and the PC, first be sure the proper COM Port is selected. Note that certain programs operating in the background may hold control of the serial ports, which could cause the computer not to recognize the COM port selected for this program. If the connection fails, the screen panel will display 'No Connection'.



8.5 Saving Real Time Data


Click on the graph window to be saved and choose 'File' - 'Save' from the main menu or click  on the tool bar. A 'Save As' menu will appear to define a file name and select the file type in which to save the data.

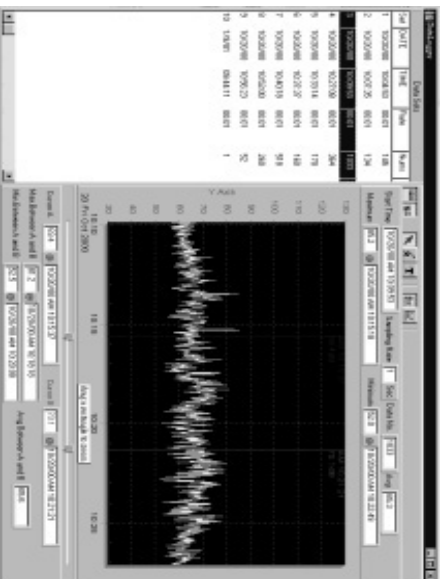
Files may be saved in any of three file formats: binary file (*.ghf), text file (*.txt) or Excel format file (*.csv). The *.ghf file uses considerably less disk space to save the data than the other two file formats, but it can only be used in Testlink SE-322. Text files can be opened by Testlink SE-322 and any other word processor program such as Microsoft Word, Notepad, etc. An EXCEL format file can be opened by Testlink SE-322 and Microsoft Excel.

7.8 Statistic 2

The section of the graph identified above as 'Statistic 2' displays statistical information relative to the recorded data between the two cursor lines, including the value and time for each cursor, the maximum and minimum values and corresponding times recorded between the cursor lines, and the average sound level for the time period between the lines. This data changes as the cursor lines are moved on the graph.

7.9 DataLogger

To download any number of stored blocks of data, power on the sound level meter, connect the instrument to the PC with the cable provided, start the Testlink program and select 'DataLogger' from the main menu or click  from the tool bar. A progress indicator will appear on the screen indicating the downloading in process. When complete, the screen will split and a record of stored data blocks will be displayed in tabular format on the left of the screen and graphical format on the right of the screen.



The tabular view will identify the data set number, date of recording, start time of each record block, the sampling rate and the total number of samples recorded. A sample Data Set chart is shown below.

Set	DATE	TIME	File Num
1	1999/7/25	PM 01:24:52	00002 10
2	1999/7/25	PM 01:25:38	00002 51:42
3	1999/7/25	PM 09:29:08	00002 21
4	1999/7/25	PM 09:32:04	00002 3
5	1999/7/25	PM 09:32:09	00002 1
6	1999/7/25	PM 09:32:14	00002 9
7	1999/7/25	PM 10:03:43	00002 1896
8	1999/7/25	PM 11:06:57	00002 3
9	1999/7/25	PM 11:49:47	00002 9086

The DataLogger program will automatically transfer the first data set to the graph. Any data set listed may be graphed by clicking on that line in the chart.

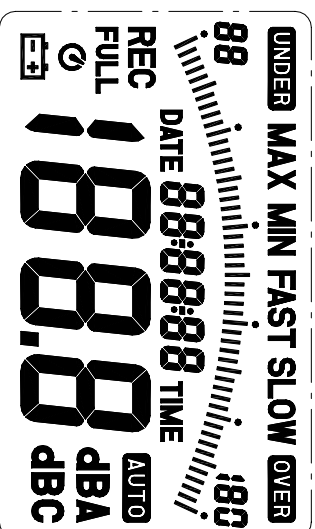
8.0 Recording and Viewing Options:



8.1 Recording to the Instrument Only

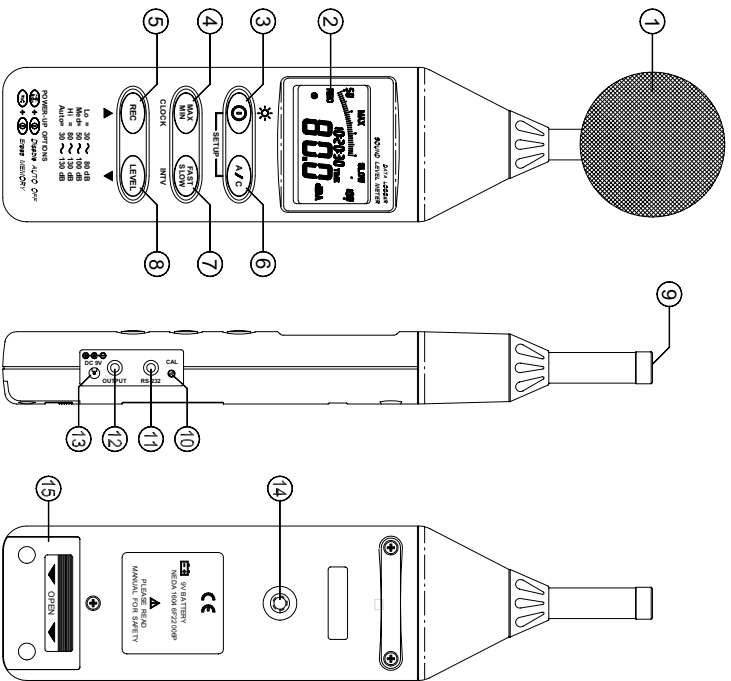
Any number of blocks of data up to the capacity of the sound level meters' internal storage capacity may be made in accordance with the instructions in Section 4.7.

Note: Ensure Recording Interval Setup has been completed per instructions in Section 4.6.

3.0 Symbol Definitions and Feature Locations:



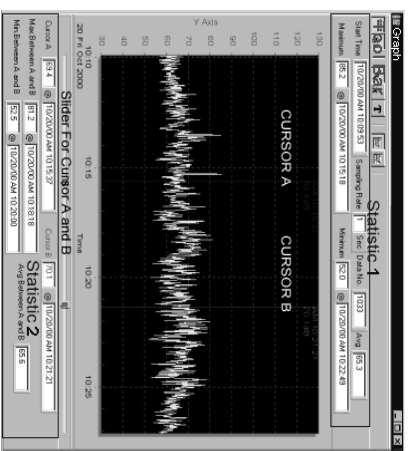
- UNDER** : Value is under range for bargraph scale selected.
- MAX** : The Maximum value is now being displayed.
- MIN** : The Minimum value is now being displayed.
- FAST** : Fast time weighting mode (125ms)
- SLOW** : Slow time weighting mode (1 Sec.)
- OVER** : Value is over range for bargraph scale selected.
- 88-180** : Analog (bargraph) scale range.
- DATE** : Indicates 'Year: Month: Day' displayed on secondary display.
- TIME** : Indicates 'Hour: Minute: Second' displayed on secondary display.
- REC** : Indicates instrument is recording data.
- AUTO** : Indicates 'Auto Level Range' selected.
- FULL** : Indicates instrument memory is full.
-  : Indicates 'Auto Power Off' is enabled.
- dBa** : A frequency weighting mode
-  : Low battery indication. Battery voltage is not sufficient for proper operation.
- LQ-** : Indicates value is under range by at least 20 dB.
- DBC** : C frequency weighting mode









- Feature Locations:**
- 1) Windscreen
 - 2) LCD display
 - 3) ON/OFF button
 - 4) MIN/MAX button
 - 5) Record button
 - 6) Frequency weighting button
 - 7) Time weighting button
 - 8) Level range control button
 - 9) Half inch electret microphone
 - 10) Offset calibration screw
 - 11) Digital output connector (RS232)
 - 12) AC and DC output signals connector
 - 13) AC Power Adaptor connector
 - 14) Tripod connector
 - 15) Battery compartment cover

7.4 Graph

A sample graph is shown below. Descriptions of the identified elements of this graph follow.



7.5 Tool Bar

-  Displays or hides Statistic 1.
-  Displays or hides Statistic 2.
-  Normal cursor
-  Turns the cursor into a cross sign on the graph. Click on the graph to mark a cross sign where placed.
-  Turns the cursor into a vertical bar on the graph. Click on the graph to bring up a text box which will annotate the graph where this bar is placed.
-  Clears last action taken.

Undo Zoom Cancels a zoomed display and returns to full graph.

Graph Option Brings up box to customize display.

Note: The customization box may also be retrieved by double clicking on the graph.

7.6 Export Statistic

Copies this statistic section to the clipboard for use in other programs. **Statistic 1**

The section of the graph identified above as 'Statistic 1' displays statistical information relative to the entire recorded time, including the start time of this recording session, the sample rate selected, the total number of data points selected, the average sound level for the entire recorded period, and the maximum and minimum values experienced along with their corresponding times of occurrence.

7.7 Graphical Display

Zoom and cursor functions are accessible on the graphical display as follows.

Zoom Function Clicking on the display and dragging the cursor will define a zoom area.

Cursor Lines

Two adjustable cursor lines are provided to numerically display data at selected points in time. These may be moved either by clicking on them on the chart and dragging to the desired point in time or by dragging the slider located below the chart. The time and sound level value for each is displayed to the top right of the cursor lines.

6.3 Taking Readings

Both the digital display and the analog bargraph will display current sound level readings in the normal operating mode.

When the sound level drops from an interim high, the bargraph will maintain a bar at the highest level reached for a brief moment after the level drops.

When in the MAX/MIN mode, the digital display will indicate the MAX or MIN as selected, but the analog bargraph will still respond to actual changing noise conditions.

6.4 Preparation for Storage

When measurements are completed and the instrument is to be stored, turn it off and remove the battery when not in use. Always store the instrument in a cool and dry environment.

7.0 TestLink SE-322 (Sound Level Meter)-RS232 Interface Software:

7.1 Installation Requirements

TestLink SE-322 Package

- 80mm CD
- Custom designed RS232 cable for TestLink

Operating System Required

Windows 95, Windows 98 or Windows NT 4.0

Minimum Hardware Required

- Pentium 90 MHz PC; 32 MB RAM
- At least 5 MB hard disk space available for TestLink program files
- Recommended display resolution is 800X600 or greater.

7.2 Installation Procedure

1. Close all other application before installing TestLink software.
2. Insert setup CD into CD disk drive.
3. Choose the Start button on the Taskbar and select Run.
4. Type E:\SETUP and choose OK to copy TestLink.exe (executable file) and Help file to your hard disk (default is c:\program files\TestLink\SE322).

7.3 Main Menu

File: Provides basic logistic functions including Opening, Saving and Printing Files, determining Printer Settings, and Exiting files.

Real Time: Starts and stops the collection of real time data.

Datalogger: The Datalogger window controls the loading of recorded data from the sound level meter.

View: Provides for selection of windows to be displayed.

Control Panel: The Control Panel window emulates the sound level meter panel to control the connected meter via the buttons in this window.

Real Time Graph: The Real-Time Graph window displays resent data in graphical format.

Window: Controls tilting or cascading displayed windows and lists open windows.

COM Port: Provides for the selection of the operative COM port.

Help: Online help information.

4.0 Control Functions:

4.1 Power and Backlight

The **⊙** button turns both the instrument power and the display backlight ON or OFF. Press it once to turn the power ON. Every subsequent momentary press toggles the backlight ON or OFF. Press and hold this button for 3 seconds to turn the power OFF. When first powered on, the display will show how much memory space is available for use, as shown to the right.

03 20 00

4.2 Frequency Weighting Selection

The frequency weighting selected is determined by the measurement application.

A Weighting: Used for safety compliance and worker exposure applications, as the A weighting most accurately emulates the frequency response of the human ear.

C Weighting: Used for environments containing a significant low frequency noise content, as the C weighting represents a more uniform response over a wider frequency range including low frequencies.

A significant difference between A weighted and C weighted results in the same environment is indicative of a substantial low frequency noise content.

4.3 Time Weighting Selection

The time weighting selected is determined by the noise content and how rapidly it varies. **Fast:** 125ms averaging time. The Fast time averaging mode is most commonly used to observe the range of sound level variation in the measured environment. Because of the relatively short averaging time, Fast response mode more accurately displays maximum and minimum sound levels experienced. When there is less than 6 dB difference between the maximum and minimum levels, the average sound level may generally be considered to be half way between the two. When there is a greater than 6 dB variation in levels, the average is considered to be 3 dB below the maximum.

Slow: 1 Second averaging time. The Slow time averaging mode is commonly used for observing the average level over a long term. The slow response mode is required in the IEC and ANSI standards for long-term worker exposure determinations.

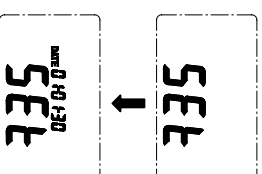
4.4 Level Selection

The sound level range to be displayed is determined by the average sound level experienced and the extremes of level variation about that average. Selection of Low (30 – 80 dB), Medium (50 – 100 dB), High (80 – 130 dB) or Auto (30 – 130 dB) is determined by the **LEVEL** button, which sequentially circulates the displayed range through these selections with each press of the button. Note that if the average sound level is outside the range selected in either direction, this will be indicated by the appearance of **UNDER** or **OVER** on the display. In the event that the level is more than 20 dB below the lower end of the range selected, the display will indicate **-10-**.

4.5 Clock Setup

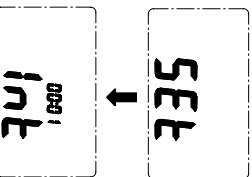
To set the real time clock:

1. Press and hold **A/C** button and then power on the meter.
 2. Press **MAX MIN** (clock).
 3. Press **REC** (↑) or **LEVEL** (↓) to increase or decrease the number, press **MAX MIN** to move to the next item. The adjusting order is: year; month; day; hour; minute. Press **MAX MIN** again after the last setting to complete the process.
- To abort during a setup process, press the **⊙** button.



4.6 Recording Interval Setup

To set the recording interval:



1. Press and hold A/C button and then power on the meter.
 2. Press **FAST SLOW** (interval):
 3. Press **REC** (↑) or **LEVEL** (↓) to increase or decrease number, press **FAST SLOW** to advance to the next item. Press **FAST SLOW** again after the last setting to complete the process.
- To abort during a setup process, press the **0** button.

4.7 Recording Data

Each momentary press of the **REC** button will alternately start and stop recording. To clear the memory, power off the meter, press and hold the **REC** button followed by the **0** button, holding both on simultaneously for at least 5 seconds, then release both buttons. The display will show 'CLR' and 'SURE' indicating that the memory has been cleared.



4.8 MAX / MIN Function

Once the appropriate weighting and level selections have been made, both the Maximum and Minimum levels may be captured and sequentially displayed. Pressing the **MAX MIN** button will first display the MAX symbol and value for the current measurement series. Pressing the **MAX MIN** button again moves the display to the MIN symbol and value. The next press of this button causes both the MAX and MIN symbols to flash and the displayed value returns to the current reading. Each successive press of the **MAX MIN** button circulates the display mode among these options.

To exit the MAX / MIN mode, press and hold the **MAX MIN** button for two seconds.

Note: Changing the frequency weighting between 'A' and 'C' will automatically clear any stored MAX and MIN values.

4.9 Auto Power Off

By default, the instrument powers on in the 'Auto Power Off' mode and will automatically shut off 30 minutes after the last key operation or RS232 communication.

To disable this feature, press and hold the **FAST SLOW** button and then power on the meter. The **0** will not be displayed, indicating that 'Auto Power Off' is disabled.

4.10 Low Battery Condition

When the battery voltage is at or below the minimum for proper operation, the **0** symbol will show on the display indicating that the battery must be replaced.

4.11 Digital Output

The RS232 Digital Output is a 9600 bps N 81 serial interface.

RX is a 5V normally high input port.
TX is a 5V normally high output port.

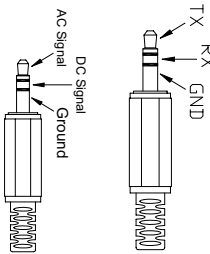
4.12 AC and DC Output Signals

The AC and DC output signals are combined on individual rings of the output connector as shown to the right.

AC: The AC output is 0 - 1Vrms over the full scale of the range selected. The output impedance of this signal is approximately 100 Ω. It is supplied to the tip of the 3.5mm coaxial connector.

Note: In the AUTO level range, the AC signal will default to the appropriate LOW, MEDIUM or HIGH scale limits.

DC: The DC output is 10mV/db with an output impedance of 1K Ω. It is supplied to the middle ring of the 3.5mm coaxial connector.



5.0 Calibration Procedure:

5.1 Calibration requirements

Calibration of the sound level meter should be conducted prior to and immediately after any critical measurements or following any prolonged storage of the instrument. Calibration requires the use of an optional Acoustic Calibrator providing a 94 dB, 1KHz sine wave signal.

5.2 Calibration Settings

Turn the instrument on and select the following settings:

- Frequency weighting: A
- Time weighting: Fast
- Level range: 50 - 100 dB
- MAX / MIN Mode: Disabled

5.3 Installing Acoustic Calibrator

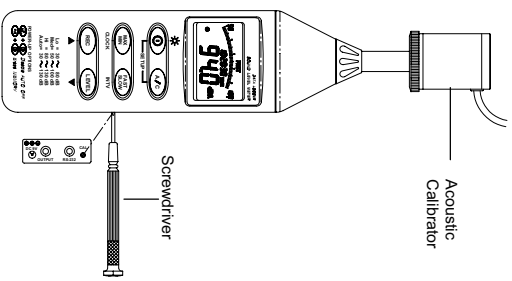
Insert the microphone housing carefully into the opening of the acoustic calibrator. Be sure the calibrator is seated firmly against the top of the microphone, but do not apply excessive force which could damage the microphone.

5.4 Adjusting Calibration

Turn the acoustic calibrator on and observe the displayed reading. If necessary, adjust the CAL potentiometer on the side of the sound level meter to 94.0 dB ± 0.2 dB with the small screwdriver provided. When re-checking calibration immediately following a measurement, the instrument should repeat the calibration setting without further adjustment.

5.5 Re-calibration

The sound level meter is supplied factory calibrated. As noted above, the calibration should be checked prior to and immediately after any critical measurements, or following any prolonged storage of the instrument. In any event, the calibration of the instrument should be verified no less than once per year.



6.0 Operating Instructions:

6.1 Preparation for Measurements

Determine if the instrument is properly calibrated or requires calibration in accordance with Section 5.0.

When being operated in an environment with a wind or airflow in excess of 10m/sec., install a windscreen over the microphone to minimize wind interference. It is actually good operating practice to leave the windscreen on the instrument at all times of measurement to avoid extraneous interference from unknown air motion.

Note: The windscreen will not protect the microphone from moisture or contamination. Take appropriate precautions to avoid prolonged use in dirty environments, wetness or severe vibration.

6.2

Proper placement of the instrument is critical to accurate measurements.

Worker exposure: Applicable standards require that the sound level meter be located within two feet (if achievable) of the ear of a worker being tested for noise exposure, and aimed in the general direction of the noise source. In the event of differing noise level exposure at each ear, measurements should be taken for the ear experiencing the highest incident noise.

Area Surveys: Locating the sound level meter will be governed by the purpose of an area survey. If the purpose is determining noise nuisance at an adjacent boundary, the instrument should be mounted on a tripod at the boundary and facing the noise source. Other situations may determine other placement criteria to accomplish the desired measurement objective.