# instructions for

# Q300
# Noise Dosimeter

**Note:** Due to the new ATEX Directive in Europe, all references in this document to "Ex" or "EEx" for intrinsic safety approvals should be disregarded effective 7/1/03 within the member countries of the European Union (EU). At this time, this product is not approved in accordance with the new ATEX Directive and is not sold for use in hazardous atmospheres or explosive zones by customers within the EU. Outside of the EU, all references to intrinsic safety continue without change.

56-447
Rev. F
8/97

**TABLE OF CONTENTS**
**Q-300 NOISE DOSIMETER**

**1. INTRODUCTION TO THE Q-300** . . . 2
1.1 Assembling the Meter . . . 2
1.2 Initial Turn On and Check . . . 3
1.3 Calibration . . . 4
Storing the Calibration Value . . . 5
1.4 Battery Installation and Removal . . . 6

**2. ABOUT THE METER** . . . 7
2.1 The Display . . . 7
2.2 Keypad Functions . . . 8
2.3 Acoustic Event Options . . . 11
2.4 Memory Capacity . . . 12
2.5 RESET - Erasing Stored Data . . . 12
2.6 Overload Detection . . . 12
2.7 Security . . . 13

**3. SETUP MENU** . . . 16
CAL . . . 16
EVENT . . . 16
RANGE . . . 17
UL . . . 17
CL . . . 17
ER . . . 17
TL . . . 17
FAST/SLOW . . . 17
A/C . . . 17
AO . . . 18
RT . . . 18
BAUD . . . 19
EOL . . . 19
FLOW . . . 19
TIME . . . 20
PDOSE . . . 20
LH-0 . . . 20
SE20 . . . 21
SE10 . . . 21
InXX . . . 21
PrnX . . . 22

**4. COMMUNICATIONS** . . . 23
4.1 Printing Data . . . 23
4.2 Parallel Printer Interface . . . 25
4.3 RS-232 Serial Interface . . . 30
4.4 Downloading Data . . . 31
4.5 ASCII Commands . . . 33

**5. GENERAL SOUND MEASUREMENT PRACTICES** . . . 35
5.1 Microphone Positioning . . . 35
5.2 Accuracy of Readings . . . 36
5.3 Microphone Windscreen . . . 36
5.4 Background Noise . . . 37

**6. TECHNICAL INFORMATION** . . . 38

6.1 Principles of Operation . . . . . 38
6.2 Microphone Characteristics . . . . . 38
6.3 Weighting Characteristics . . . . . 40
6.4 Tone Burst Response . . . . . 41

**7. SPECIFICATIONS** . . . . . 42

**8. ACCESSORIES** . . . . . 43
8.1 Using The Microphone Boom . . . . . 44
8.2 AC/DC Adapter Installation . . . . . 45

**9.0 TROUBLESHOOTING** . . . . . 46

**APPENDIX** . . . . . 47
Definitions . . . . . 47
Typical Setups . . . . . 50
Acoustical Formulas . . . . . 51

**QUEST SERVICE AND WARRANTY POLICY** . . . . . 53



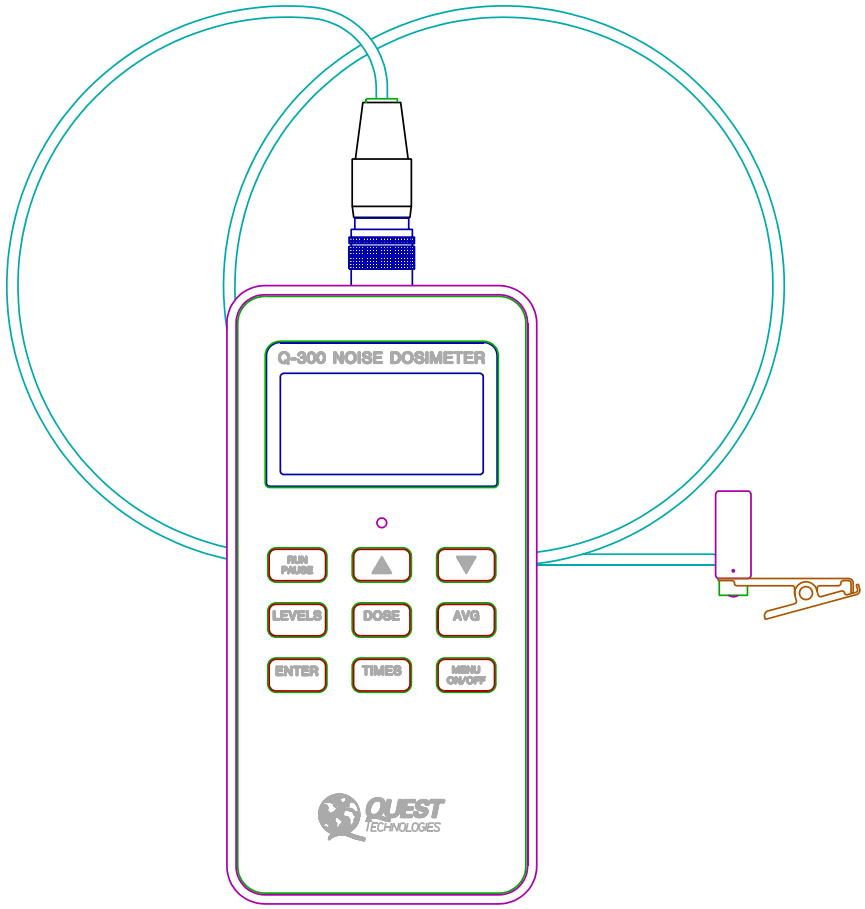



**Figure 1**. Q-300 Noise Dosimeter.

## 1. INTRODUCTION TO THE Q-300

The Quest Model Q-300 noise dosimeter performs a wide variety of acoustical measurements. Both exponential averaged and time integrated measurements may be made, and the results logged in internal memory. The output of an unweighted peak detector may also be displayed or logged. Applications include industrial, and general acoustical measurement and analysis. The Q-300 delivers Type 2 accuracy for general field survey work.

The Q-300 performs the calculations for three dosimeters operating simultaneously in one instrument. A numerical readout of measurements for any of the three dosimeters may be displayed. The results of individual sound studies may be stored in internal memory for future reference. Meter operation is controlled from the keypad. Data may be sent to a parallel or serial printer, or to a computer by using an appropriate interface cable.

The Q-300 may be clipped on a belt or worn in a shirt pocket. The small microphone is simply clipped to the shirt near the ear. The meters are housed in a tough diecast aluminum case to protect against physical abuse as well as external electrical interference, such as that from motors or portable radios.

When used with a Personal Computer, the Quest Noise Manager software package allows the user to analyze and print out pre-recorded data in detail. When used with a printer, the dosimeter can print detailed reports of noise events. It connects to a printer by using a Quest "Parallel Printer Interface" or "Serial Computer Interface".

**1.1 Assembling the Meter**

The microphone must be connected to the dosimeter prior to making any measurements. The connector on the top of the Q-300 is used for both the microphone and the communications interfaces.

To remove the cable connector from the dosimeter, gently grasp and pull the knurled ring of the cable connector.

To attach the cable connector to the dosimeter:

1.) Grasp the black rubber boot of the cable connector.

2.) Gently press the cable connector against the dosimeter connector while slowly rotating it. When it is properly lined up, it will stop rotating and slide into the dosimeter's connector.

3.) Insert the cable connector until a "click" is heard.
The cable connector is now attached.



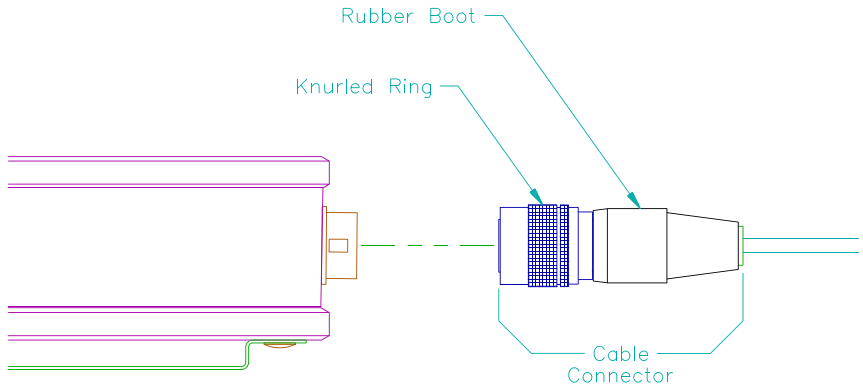



**Figure 2**. Q-300 Cable Connection.

**1.2 Initial Turn On and Check**

Before taking measurements with the Q-300, there is a series of quick checks that should be performed. Turn the unit on by pressing the ON/OFF key. The display will indicate that a brief warmup is taking place. Check for the LOBAT indicator in the display. If it indicates a low battery condition, replace the battery.

" on " will appear in the display after warmup. Pressing a FUNCTION key (LEVELS, DOSE, AVG or TIMES) will select a different display. Press the LEVELS key once, followed by the ª and « keys to review the possible measurements. Pressing LEVELS again will display data for another dosimeter. Do this for each of the other FUNCTION keys. When you have done this, press LEVELS and ª or « to set the display to read SPL. The meter is now displaying current Sound Pressure Level, updating the reading every second.

To perform an Acoustic Study, press RUN/PAUSE. Allow the meter to run for a while and press RUN/PAUSE again to end the study. The FUNCTION keys may now be used to review the results.

### 1.3 Calibration

Although the Q-300 will maintain accurate calibration over a long period of time, the calibration should be checked before each use. To check the calibration of the Q-300, perform the following procedure using a Quest calibrator.

1. Check that the LOBAT indicator is not on, indicating a weak battery.
2. Turn the calibrator ON. If optional, set the frequency to 1 kHz. Note the SPL of the calibrator. Make sure that the calibrator output is within the measuring range to which the Q-300 is currently set.
3. Insert the microphone fully into the calibrator adapter ring, if required for the size microphone in use.
4. Slowly place the calibrator onto the adapter/microphone.
5. Press LEVELS. Use the ^ or « keys to set the Q-300 to read SPL. The display should read the proper level within 0.5dB.

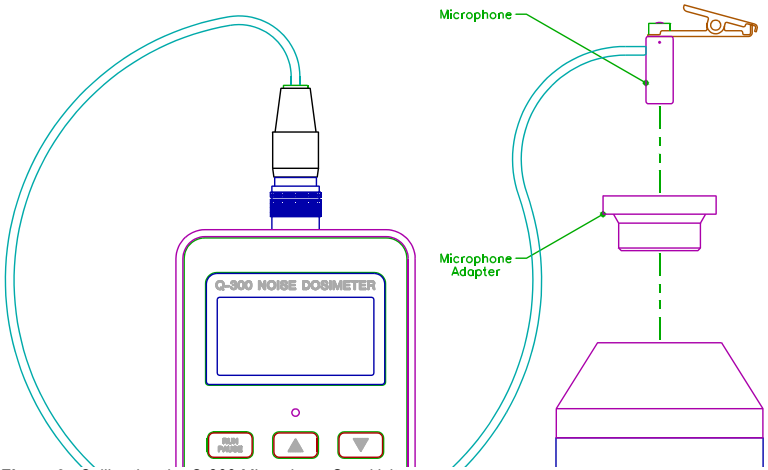



**Figure 3**. Calibrating the Q-300 Microphone Sensitivity.



NOTE: Most calibrators are affected by changes in altitude and barometric pressure. The rated SPL is set at standard barometric pressure at sea level (760 mm Hg). Consult your calibrator manual for correction factors.

### Storing the Calibration Value

The Q-300 can store the time, date and SPL of a calibration, which will be included in the printout and in downloaded data for each study. If there is data in memory the unit must be RESET prior to performing a calibration (see page 12). To perform a calibration, enter the following key sequence:


The CAL annunciator in the display will light, and the number in the display should match the output level of the calibrator. (To change this value, refer to section 3, Setup Menu.) Connect the microphone to the calibrator as directed in steps 2,3 and 4 of the previous section. Press RUN to begin the calibration routine. The display will read " CAL " and, after a few seconds, return to the previous CAL display. The calibration SPL, time and date are now stored. If the calibration fails, " FAIL " will appear in the display.

NOTE: When RUN is pressed to store the calibration value, A weighted SPL and C weighted SPL are measured and set equal to each other. The unweighted logging peak detector is also calibrated, setting its output at 3dB above the RMS level shown in the display. The Q300 must be calibrated at a frequency of 1kHz, as this condition is only true at 1kHz (and 6.2kHz).

As the peak detector is most accurate over the upper portion of the range, the calibration value should be in the upper 40dB of the range used for calibration. It is important to not disturb the microphone during the calibration routine, as this may cause a high peak reading and result in bad peak data.

The dosimeter will maintain its accuracy for many months of use. However, it is recommended that the dosimeter be returned annually to a Quest Authorized service station for a recalibration.
Calibration standards, traceable to the National Institute of Standards and Technology (NIST) are maintained and used by Quest.

### 1.4 Battery Installation and Removal

The battery must be a 9 Volt alkaline type.
(Examples are: NEDA 1604A, IEC 6LF22, or IEC 6LR61)

Replace the battery as follows (see Figure 4):

1.) Remove the battery cover.

2.) Lift the non-terminal end of the battery out of the battery compartment.

3.) Remove the battery.

4.) Notice the battery orientation drawing on the battery cover. Be sure that the battery is properly oriented with respect to the battery compartment terminals.

5.) Angle the non-terminal end of the battery into the battery compartment, and press it down into the holder.

6.) Install the battery cover.

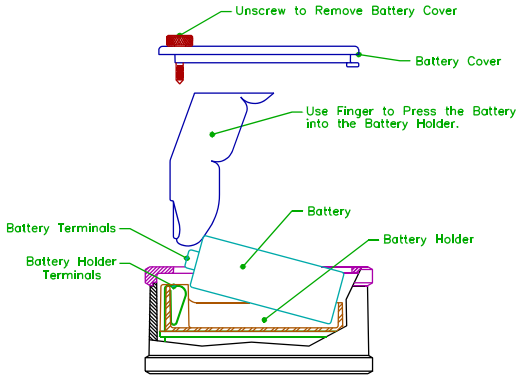



**Figure 4**. Battery Installation and Removal.

An internal battery powers the clock and memory. When this battery's voltage gets low, data memory and setup will not be retained when a 9V battery is not in the dosimeter. The memory only draws current from this battery when a 9V battery is not in the unit. Contact the factory or a Quest service center for replacement.



## 2. ABOUT THE METER

### 2.1 The Display

The LCD display provides the user with the selected measurement and the measurement parameters (A or C weighting, FAST or SLOW response). Instrument status such as low battery ( LOBAT ), RUN , PAUSE , and Overload ( OL ) is also displayed.

**OL** - Overload indicator lights when the sound level exceeds the measurement range of the instrument. While in RUN, this indicator stays lit until the dosimeter is RESET.

**SLOW** or **FAST** - indicates the time response of the measurement being viewed.

**C**, or **A** - indicates the frequency weighting of the measurement being viewed.

**RUN** or **PAUSE** - indicates the operating status of the instrument.

**LOBAT** - when not lit, indicates at least 8 hours of battery life remaining.

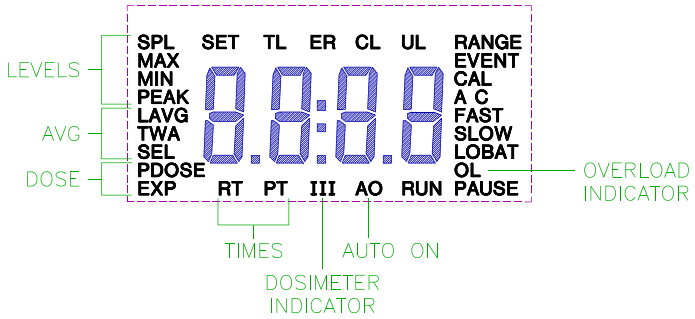



**Figure 5** Q-300 Display

**2.2 Keypad Functions**

MENU ON/OFF

Pressing this key turns the meter on. After a warmup period of several seconds, the display will read " on " and the dosimeter is ready to use. Pressing and holding this key will cause the display to read " OFF5 "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 meter off. Briefly pressing and releasing this key will toggle the display between " on " and " rES5 " (Reset), except while in RUN mode when the display will read " run ".

RUN PAUSE

Pressing this key begins a study and lights the RUN indicator. Pressing again ends the study and lights the PAUSE indicator. 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.

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.

▲ ▼

The up or down arrows are used to select specific measurements within each of the function displays. For example, after pressing LEVELS, the arrow keys may be used to select SPL, MAX, MIN or PEAK for display. The arrow keys are also used to select items in the setup menu, or to set the values for a particular item in the setup menu.



LEVELS

The LEVELS function key selects the group of items SPL, MAX, MIN or PEAK for display. The ª and « keys are used to select the specific item. Pressing LEVELS again selects the next dosimeter's (I, II or III) levels for display. If two or more dosimeters have identical measurement parameters, the higher number dosimeter will not be displayed. The levels between dosimeters will only differ if the time constant selected for one dosimeter differs from that of the other two.

SPL - Sound Pressure Level (SPL) will be displayed, with the selected weighting and response characteristics. The value displayed is the maximum SPL during the previous second.

MAX - The Maximum SPL while in the RUN mode is displayed.

MIN - The Minimum SPL while in the RUN mode is displayed.

PEAK - The Peak Level. The output of the peak detector may be viewed as PEAK or logged. Peak values are the maximum measured while in RUN mode, except when no RUN time has been accumulated.

DOSE

The DOSE function key selects the group of items DOSE, PDOSE or EXP for display. The ª and « keys are used to select the specific item. Pressing DOSE again selects the next dosimeter's (I, II or III) dose group to be displayed. If two or more dosimeters have identical measurement parameters, the higher number dosimeter will not be displayed.

DOSE - Percentage of allowable sound energy that a person may be exposed to during a work day based on the criterion level, threshold level and exchange rate selected for the particular dosimeter.

PDOSE - Projected dose, calculated by assuming the average sound level measured during the run time and extrapolating to the number of hours selected in the setup menu.

EXP - Sound Exposure in Pascal-squared hours. The display will show " ---- " if the exchange rate is not 3dB.

AVG

The AVG function key selects the group of items LAVG, TWA or SEL for display. The ª and « keys are used to select the specific item. Pressing AVG again selects the next dosimeter's (I, II or III) averages to be displayed. If two or more dosimeters have identical measurement parameters, the higher number dosimeter will not be displayed.

LAVG - The average level over the study. This measurement takes into account the threshold and exchange rate entered in the setup menu.

TWA - Time Weighted Average. The average level accumulated during a study, but calculated with an eight hour integration time.

SEL - The Sound Exposure Level is the constant sound level which, if lasting for one second, would deliver the same amount of acoustical energy as that accumulated over the entire study.

TIMES

The TIMES function key selects the group of items RT, PT or UL (Run Time, Pause Time or Upper Limit Time) for display. The ª and « keys are used to select the specific item, with a minutes:seconds display and an hours display available for each item. Pressing TIMES again selects the next dosimeter's (I, II or III) times to be displayed, where UL time may differ. If two or more dosimeters have identical measurement parameters, the higher number dosimeter will not be displayed.

RT - The total RUN time will be displayed. Time may be displayed in MIN:SEC and xx:HRS. The MIN:SEC display for a study that lasts over one hour will wrap around to 00:00. The xx:HRS display will count to 99:Hr and then wrap around to 00:00 but the actual time will be stored in memory.

PT - Total PAUSE time since the last time the unit was reset. Pause time is displayed in the same manner as Run time.

UL - Upper Limit Time, or the time that the SPL exceeded the Upper Limit Level set for that dosimeter in the setup menu.



**2.3 Acoustic Event Options**

The Q-300 presents measurement data as follows. Each time that the unit is Run and Paused creates an **Event**, which is a set of measurements performed over a user defined period of time, referred to as the **Run Time**. The event begins at the **Start Time** and ends at the **Stop Time**. Each event is stored in internal memory, with its own data referred to as the **Event Summary**. The **Overall Summary** is the result of all measurements taken since the last RESET. The time between events is recorded as **Pause Time**. The Current Event is indicated in the Setup Menu display as " Cxxx " where xxx is the event number. This is the event initiated the last time the Q300 was placed in RUN.

An event may be initiated and ended in the following ways:

Manual Event - Press RUN/PAUSE to begin an event, causing the RUN indicator to light. Press RUN/PAUSE again to end the event, causing the PAUSE indicator to light.

Manual Timed Event - Press RUN/PAUSE to begin an event. If a Programmed Run Time duration has been set, the event will run for this time duration and automatically stop. The event may be interrupted by pressing the PAUSE key.

Auto Timed Event - An Auto ON time and date must be set and enabled in the setup menu and the Q-300 must be turned OFF. When the internal clock/calendar reaches this time and date, the meter will turn on, warm up for 10 seconds and begin an event. The duration of the event will be that of the Programmed Run Time stored via the setup menu. At the end of the event, the unit will PAUSE and turn itself OFF. The event may be interrupted by depressing the PAUSE key.

Data viewed on the display is normally the Overall Summary Data. SPL is active only while viewing the current event. In the EVENT portion of the Setup Menu, it is possible to view the data from the current event as it happens, or from previous events while still in RUN mode. The RUN/PAUSE key may be used to start and stop events while in the EVENT portion of the Setup Menu. Each time an event is started, the number of that event will briefly appear in the display. Refer to Section 3, Setup Menu.

## 2.4 Memory Capacity

The number of events possible is limited by the available memory. Data stored during events also fills memory, so the length of each event is a factor in determining the total number possible, with longer events using more memory. Data is logged at a set rate of once every minute. Run time without logging data is limited to 145 hours and 38 minutes. The Q300 will automatically PAUSE and display " AOL " if this limit is reached. Without logging, a maximum of 300 events is possible. Maximum logging time is 52 hours.

The dosimeter will log the following items:

3 LAVGs, 2 LMAXs, 1 Unweighted PEAK

In addition the total amount of energy accumulated during a study is limited. If this limit is reached the Q300 will PAUSE and display " AOL ". This is dependent upon the range setting and how high the SPLs are during the study. This can be determined from the value of SEL at various exchange rates as follows:

| Exchange Rate | Maximum SEL Without Overflow |
|---|---|
| 3 dB | 129 dB + Range |
| 4 dB | 172 dB + Range |
| 5 dB | 215 dB + Range |
| 6 dB | 258 dB + Range |

For example, with an exchange rate of 3dB on the 70 - 140 dB range, the maximum SEL without overflow would be 129 dB + 70 dB = 199dB.

## 2.5 RESET - Erasing Stored Data

To erase the data in memory, the Q-300 must be in the PAUSE mode. Press the MENU/ON/OFF key until " rES5 " is displayed. Press and hold the ENTER key for five seconds. The display will count down from " rES5 " to " rES1 ". After five seconds the data memory will be cleared, the display will briefly show " ---- ", and " on " will be displayed.

## 2.6 Overload Detection

While viewing SPL the overload indicator (OL) is displayed whenever the incoming signal saturates (overloads) the circuitry. If an OL condition occurs while in the RUN mode, the OL indicator will light and remain on for the duration of the study.

If an overload ocurred, it will be indicated on the hard copy printout. While reviewing an event in memory, the OL indicator will remain on if an overload occurred during that study.



## 2.7 Security

The Security feature allows you to lock out another person's access to certain dosimeter functions. There are two security modes, which appear in the Setup Menu as SE1x and SE2x.

**SE1** enabled (SE11 in the setup menu display) secures the units controls while it is in the RUN mode. To unlock the dosimeter, a four digit security code must be entered.

**SE2** enabled (SE21 in the setup menu display) prevents changing any Setup Menu items (except SE1). To unlock the setup a four digit security code must be entered.

SE10 or SE20 in the display indicates that either security function is disabled. To enable either security feature, press the following keys:


" On " shown in display

Down Arrow 2 (or 3) times
to SE10 (or SE20) in display


SET indicator ON

Up or Down Arrow to change
SE10 to SE11 in display


"0---" in display


4x; ª « to set, and ENTER
to enter four digits

Returns to SE11 (or SE21) display

If SE1 is enabled, after the unit is put into the RUN mode only the arrow and ENTER keys will operate. The display will read
"0---". Press the arrow keys to set the first digit between 0 and 9. Pressing ENTER moves on to the next digit. After all four digits have been entered, the unit is no longer secured. If the Q-300 remains in RUN mode, data may be reviewed per normal operation and the unit resecured by going to the SE10 display in the Setup Menu and pressing ENTER, $^{a}$, ENTER. This will immediately change "SE10" to "SE11" and retain the same security code.

Pausing the dosimeter disables SE1. SE1 must be enabled prior to placing the unit in RUN by going to the SE10 display in the Setup Menu and pressing ENTER, $^{a}$ and ENTER four more times to keep the same code.

**NOTE**: SE1 may be disabled with either the SE1 or SE2 code.

Security feature SE1 can be used with Auto-On. An Auto-On time and date may be programmed and SE1 enabled. By turning the unit off, the Q-300 will turn itself on and RUN at the specified time and date. The unit will be secured during that RUN period.

If SE2 is enabled the Setup Menus may be reviewed, but not altered, except for enabling or disabling SE1. To disable SE2, go to the "SE21" display in the Setup Menu and press ENTER. "0---" will be displayed. Enter the four digit code as instructed above. After successfully entering the last digit the display will return to "SE20" and the setup will no longer be secured.

Once you have entered the security code, be sure that you don't forget it! If you do, once the unit is placed into the Secure Mode, you will not be able to disable it unless you know the exact code.

Memorize your codes and, if you wish, record the codes here.

SE1 SECURITY CODE ____ ____ ____ ____

SE2 SECURITY CODE ____ ____ ____ ____

If the code is forgotten, you must do one of the following:

Call Quest at 1-800-245-0779. Quest will provide you with a security code that will allow you to gain access to the Q-300.

FAX Quest at 1-262-567-4047. Quest will FAX you a security code that will allow you to gain access to the Security Function.



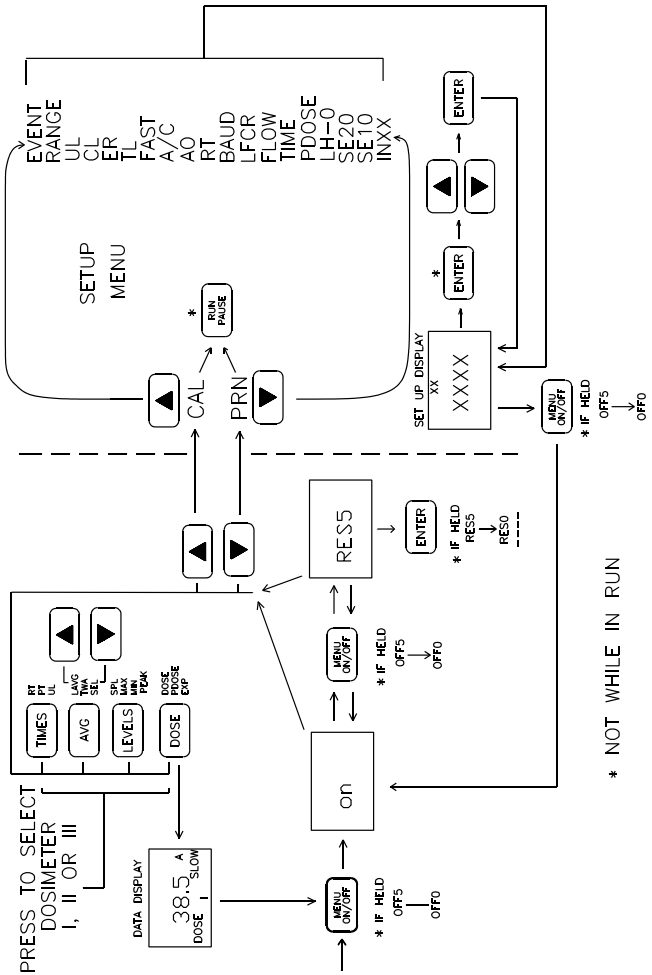



**Figure 6**. Q-300 Flow Diagram

### 3. SETUP MENU

The Setup Menu allows the user to customize the operation of the Q-300. Such parameters as printout content, RS-232 communications options, measurement parameters, security options and automatic operation can be selected. These parameters may only be changed while in PAUSE mode, and measurement parameters may only be changed after the memory has been cleared (RESET), but contents of the Setup Menu may be reviewed at any time.

To enter the Setup Menu, press MENU/ON/OFF and either the ª or « key to get to either the CAL or PRINT display. From either display, the ª or « key will step around the Setup Menu. The menu items are discussed below in the order that they are encountered using the ª key. (Refer to figure 6).

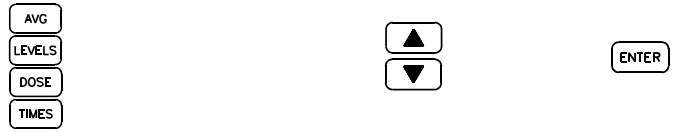
**CAL** (Refer to section 1.3 for procedure)

The calibration display has the CAL indicator turned on and the expected calibration value shown in the display. If the value in the display is not that of the calibrator being used, this number must be corrected by the following key sequence:


SET indicator on  Set desired value  SET indicator off

**EVENT**

The event display will light the EVENT indicator and CXXX will show the current event (the event initiated the last time the Q300 was placed in RUN), with XXX being the event number. To view the current event, press the following key sequence:




Desired Data Group  Desired Measurement  Return to Menu



To select a different event for review, press the following:


SET indicator on  Select event number  Return to Menu
'C' changes to 'r'  SET turns off

Pressing any of the four FUNCTION keys, followed by the arrow keys, will select the desired measurement for display. Press ENTER to return to the menu. Event data may be reviewed at any time, whether in RUN or PAUSE.

Measurement Parameters

The following group of menu items determines how the measurements are performed for each dosimeter. Each item may be set differently for each of the three dosimeters, except for RANGE and A/C (frequency weighting) which are set once for all three dosimeters.

**RANGE** Set to LO (40 - 110dB) or HI (70 - 140dB)

**UL** Upper Limit Level; Set level in decibels, 40 to 140

**CL** Criterion Level; Set level in decibels, 40 to 140

**ER** Exchange Rate; Set to 3, 4, 5 or 6 decibels

**TL** Threshold Level; Set level in decibels, 40 - 140

**FAST/SLOW** Response Time; Set to FAST or SLOW

**A/C** Frequency Weighting; Set to A or C for all dosimeters

These items are all set in the same manner. When the desired item is displayed, its indicator will be turned on, its value will be displayed and the dosimeter (I, II or III) will be shown at the bottom of the display.

To select which dosimeter's parameter is displayed, press:


When the desired dosimeter's value is displayed, press:


SET indicator on  Set desired value  SET indicator off

Auto Run Options

**AO** Auto-On Time and Date. Set time and date that the Q-300 will turn on and go into Rmode (after a 10 second warmup). The AO indicator will be on while viewing or setting this item. Time is set in 24 hour format, or military time.

**RT** Run Time Duration. Set length of time in hours:minutes to a maximum of 50 hours and zero minutes that the Q-300 will run following a RUN command. The RT indicator will be on while viewing or setting this item. Setting to 00:00 disables this function.

Auto-On time and date has 3 displays to set: XX:XX (time)
dY:XX (day)
o :XX (month)

Run Time duration has 1 display to set: XX:XX (time).

To enable, disable or set a value press:


SET indicator on Selects value or OFF If OFF, SET off.

If the value was left in the display, pressing enter will blank the minutes. Hours must now be set. Setting one value and pressing ENTER stores that value and advances to the next value to be set. To set a value press:


Set desired value Store and go to next value

After setting the last value, the SET indicator will turn off. To review the settings, repeatedly press ENTER without pressing the arrow keys to advance through the screens.



Communications Parameters

**BAUD** Baud rate, or data rate for RS-232 communications. Set to the same rate as the computer or printer being used. Choices are 300 through 19200 baud or PRLL for parallel printer operation. These are displayed as follows:

| | |
|---|---|
| b.300 | 300 baud |
| b.600 | 600 baud |
| b. 1.2 | 1200 baud |
| b. 2.4 | 2400 baud |
| b. 4.8 | 4800 baud |
| b. 9.6 | 9600 baud |
| b.19.2 | 19200 baud |
| PrLL | Parallel |

**EOL** End of Line character for data transmission. The choices are displayed as follows:

| | |
|---|---|
| LF | Line Feed |
| LFCr | Line Feed + Carriage Return |
| Cr | Carriage Return |
| CrLF | Carriage Return + Line Feed |

**FLOW** Flow control (handshaking) option for data communications. This is important for error free transmission of large amounts of data. The flow control used is XON / XOFF , or software control and should be set the same on the computer or printer being used. The options are displayed as follows:

| | |
|---|---|
| FLo1 | Software control (XON / XOFF) |
| FLo0 | No flow control |

To set a value press:


SET indicator on Set desired value SET indicator off

**TIME** Time of day, date, month and year are set one item at a time. Setting and storing one value advances to the next until all items have been stored. The displays are shown as follows:

| | |
|---|---|
| XX:XX | Time (24 hour military time) |
| dY:XX | Day of the month |
| o :XX | Month |
| 199X | Year |

To set a value press:


SET indicator on Set desired value Store and go to next value

After setting the last value, the SET indicator will turn off.

**PDOSE** Projected dose time. Set to desired number of hours for projected dose calculation, from 1 to 18 hours, displayed as XXHr.

To set a value press:


SET indicator on Set desired value SET indicator off

**LH-0** Data Logging History turned on or off. LH-0 indicates logging disabled, LH-1 indicates logging enabled. Disabling data logging saves memory while in RUN, allowing more Events.

To set LH-0 or LH-1 press:


SET indicator on Set desired value SET indicator off

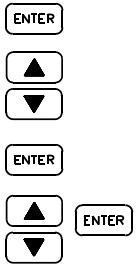


Security Features

**SE20** Security mode for locking all setup parameters.

**SE10** Security mode to lock unit operation while in RUN mode:

The last digit of either display can be a 1 or a 0. 1 indicates that security is enabled, and 0 indicates that security is disabled. To enable or disable security, change the 0 to a 1, and enter a four digit code using the arrow and ENTER keys. After correctly entering the last digit, the display will return to the SE11 or SE21 display. See section 2.7, Security, for details. To enable either security feature, press the following keys: (example shows SE1)




SET indicator ON

Up or Down Arrow to change SE10 to SE11 in display

"0---" in display

4x; [a] « to set, and ENTER to enter four digits

Returns to SE11 display

To disable security, press ENTER at the SE11 or SE21 display. Then enter the code which returns to the SE10 or SE20 display.

**InXX** Printout Interval for shortening the printout when printing logged data, where XX is the number of minutes of data combined into one data point. Data is logged at one minute intervals. Printout Interval may be set to 1, 5, 10, 15, 30 or 60 minutes. To set this value press:


SET indicator on Set desired value SET indicator off

**PrnX** Printout mode display, also used to determine the printout contents. Choices include turning logged data and statistics on or off and whether or not to print event summaries. The choices are displayed as follows:

| | Logged Data | Statistics | Events |
|---|---|---|---|
| Prn0 | Off | Off | Off |
| Prn1 | On | Off | Off |
| Prn2 | Off | On | Off |
| Prn3 | On | On | Off |
| Prn4 | Off | Off | On |
| Prn5 | On | Off | On |
| Prn6 | Off | On | On |
| Prn7 | On | On | On |

If Events is turned on, logged data is presented for each event rather than for the overall study. To set this value press:


SET indicator on Set desired value SET indicator off

Press RUN to print.



## 4. COMMUNICATIONS

### DEFINITIONS

**PARALLEL MODE**: Data is passed along multiple wires simultaneously. This is used for sending information to parallel printers.

**SERIAL MODE**: All of the data is passed along a single wire in a sequential stream. This mode is used when sending information to a computer or serial printers. RS-232 is a type of serial mode communication.

**BAUD RATE**: Baud rate is the speed at which serial communications take place, measured in bits per second. The baud rate options for the Q-300 are 300, 600, 1200, 2400, 4800, 9600, and 19,200. The higher the baud rate, the faster the communication. When trying to pass information from an instrument to a computer or serial printer, both must be set for the same baud rate. (Baud rate settings have no affect on parallel printing.)

**COM PORT**: Abbreviated name for a serial communications port on a computer (also called RS232 port). Most PCs have between 1 and 4 serial ports referred to as COM1, COM2, etc... This is where the cable from the meter connects to the PC. The COM ports generally will take the form of either a 25 pin male (has pins instead of holes) connector or a 9 pin male connector.

### 4.1 Printing Data

The Q-300 may be connected to either a parallel or serial (RS-232) printer by using the proper cable and adapter. Data may also be printed directly to a PC by using a communications package such as Procomm or Windows Terminal. The printout contains the Overall Summary information and individual Events, if desired, including:

1. All measurement parameters (Range, Weighting, etc.)
2. Data Summary of all measured parameters (LEQ, LMAX, etc.)
3. Start, Stop and Run Times and OL

The information printed will be that selected in the Print portion of the Setup Menu (PRNX - Refer to section 3). See the end of this section for a sample printout. The printout sections selected in the setup menu are labeled on the sample printout for clarity.

To connect the Q-300 to a parallel printer, the 056-957 Parallel Interface is required. The 10 pin circular connector plugs into the jack on the top of the meter. The 36 pin flat cable connector plugs into the printer. The meter must be set for parallel operation (PRLL option for Baud Rate, located in the Setup Menu - Refer to section 3).

The Q-300 and the printer should all have their power switches turned ON. The meter must be in PAUSE mode. The display must be set to the PRNX portion of the setup menu. Pressing the RUN/PAUSE key will start the printout.

To interrupt a printout, press RUN/PAUSE again. Disconnect the interface from the printer before turning the Q-300 off.

The Q-300 can be connected to a serial (RS-232) printer or a PC by using the Serial Communications Interface (056-956). A 25-pin male to male gender changer will be required for connection to the printer. The printer's communications parameters must match that of the Q-300. Refer to the following section.

Some printers can work either in serial or parallel mode. The printer must be set up for one or the other. Simply plugging into the correct connector is not sufficient. Refer to the printer's manual. THE Q-300 HAS A SEPARATE CABLE FOR CONNECTING TO A PARALLEL PRINTER. THE SERIAL CABLE **CANNOT** BE ADAPTED TO WORK WITH A PARALLEL PRINTER.

### 4.2 Parallel Printer Interface

The Parallel Printer Interface is compatible with most Centronics compatible printers. The 056-957 contains electronics which converts data from the Q-300 into parallel information. The electronics are powered from the Q-300. (An older version of this cable required its own 9 volt battery.)


**Figure 7**. Parallel Printer Interface.

The Output Format of the Parallel Printer Interface is as follows:

The dosimeter sets up 8 data lines.

If the Busy line is not high, the dosimeter sends a Strobe pulse.

If the Busy line is high, the dosimeter will wait.



**General Printer Configuration (Parallel and Serial)**

Each line of print must end with the following two EOL (End of Line) characters:

| | |
|---|---|
| LF | (Line Feed) |
| CR | (Carriage Return) |

The EOL (End of Line) characters can be:

Both set within the printer configuration.

Both set within the dosimeter configuration.

One setting within the printer configuration and one setting within the dosimeter configuration.

The dosimeter can be programmed to one of the following four settings:

| | |
|---|---|
| LF/Cr | (Line Feed followed by Carriage Return) |
| Cr/LF | (Carriage Return followed by Line Feed) |
| LF | (Line Feed only) |
| Cr | (Carriage Return only) |

To try a few lines of print, depress RUN/PAUSE twice. If the printer does not work properly, change the dosimeter setting until it works.

If the system still does not print properly, you may need to change the printer setup. Refer to the printer manual to aid in the printer configuration. After changing the printer setup, it is usually necessary to reset the printer as follows:

Turn the printer off for a few seconds and then back on. Most printers only read these switches during the turn on.

**Parallel Printer Configuration**

The printer must be Centronics compatible.

The dosimeter baud rate does not matter.

If the printer operates in either the Serial or Parallel mode, be sure that it is set to Parallel.

**Serial Printer Configuration**

Refer to section 4.3, RS-232 Serial Interface.

## SAMPLE PRINTOUT

(HEADER and OVERALL SUMMARY)

```
                    QUEST TECHNOLOGIES
                Q300 NOISE LOGGING DOSIMETER

Unit Version Number: 1.00                    Serial Number: QC50100005

Name _____________________________________________________________

Work Area ________________________________________________________

Comments _________________________________________________________

_____________________________________________________________________

Meter Calibration:    114.0dB       10-MAR-95 @ 13:06:18

Calibrator:
Serial Number _____________________     Calibration Date _____________________

Measuring Parameters: ( Range 70-140    Weighting A )
DOSIMETER 1              DOSIMETER 2              DOSIMETER 3
Time Constant    SLOW    Time Constant    SLOW    Time Constant    SLOW
Exchange Rate     5dB    Exchange Rate     5dB    Exchange Rate     3dB
Threshold        80dB    Threshold        90dB    Threshold        80dB
Criterion        90dB    Criterion        90dB    Criterion        85dB
Upper Limit     115dB    Upper Limit     115dB    Upper Limit     115dB

Session Started        Session Stopped        Run Time
18-MAR-95 @ 13:32:45   18-MAR-95 @ 14:53:21    1:21:36  O.L. Occurred

DOSIMETER 1
Peak Level      124.5dB  18-MAR-95 @ 13:32:45
Slow Max Level  114.4dB  18-MAR-95 @ 13:32:45    UL TIME 0:00:00
Slow Min Level   99.8dB  18-MAR-95 @ 13:33:18

LAVG    108.5dB    TWA     79.6dB    DOSE     1.6%     DOSE(12) 1500%
SEL(5)  126.2dB    Pa2Hr    0.2

DOSIMETER 2
Peak Level      124.5dB  18-MAR-95 @ 13:32:45
Slow Max Level  114.4dB  18-MAR-95 @ 13:32:45    UL TIME 0:00:00
Slow Min Level   99.8dB  18-MAR-95 @ 13:33:18

LAVG    109.5dB    TWA     80.6dB    DOSE     2.6%     DOSE(12) 1556%
SEL(5)  126.2dB    Pa2Hr    0.2

DOSIMETER 3
Peak Level      124.5dB  18-MAR-95 @ 13:32:45
Slow Max Level  114.4dB  18-MAR-95 @ 13:32:45    UL TIME 0:00:08
Slow Min Level   99.8dB  18-MAR-95 @ 13:33:18

LAVG    110.5dB    TWA     81.6dB    DOSE     4.2%     DOSE(12) 3076%
SEL(3)  118.2dB    Pa2Hr    0.2

                                                              Page 1
```



(EVENT SUMMARY)

```
EVENT (1)
Notes _____________________________________________________________

_____________________________________________________________________

Session Started        Session Stopped        Run Time
18-MAR-95 @ 13:32:45   18-MAR-95 @ 14:53:21    1:21:36

DOSIMETER 1
Peak Level      124.5dB  18-MAR-95 @ 13:32:45
Slow Max Level  114.4dB  18-MAR-95 @ 13:32:45    UL TIME 0:00:00
Slow Min Level   99.8dB  18-MAR-95 @ 13:33:18

LAVG    108.5dB    TWA     79.6dB    DOSE     1.6%     DOSE(12) 1500%
SEL(5)  126.2dB    Pa2Hr    0.2

DOSIMETER 2
Peak Level      124.5dB  18-MAR-95 @ 13:32:45
Slow Max Level  114.4dB  18-MAR-95 @ 13:32:45    UL TIME 0:00:00
Slow Min Level   99.8dB  18-MAR-95 @ 13:33:18

LAVG    109.5dB    TWA     80.6dB    DOSE     2.6%     DOSE(12) 1556%
SEL(5)  126.2dB    Pa2Hr    0.2

DOSIMETER 3
Peak Level      124.5dB  18-MAR-95 @ 13:32:45
Slow Max Level  114.4dB  18-MAR-95 @ 13:32:45    UL TIME 0:00:00
Slow Min Level   99.8dB  18-MAR-95 @ 13:33:18

LAVG    110.5dB    TWA     81.6dB    DOSE     4.2%     DOSE(12) 3076%
SEL(3)  118.2dB    Pa2Hr    0.2
```

(LOGGED DATA)

```
EVENT (1) LOGGING
LAVG 1 (5 MINUTE TIME HISTORY)

13:37  112  114  117  114  113dB  +----+----+----+----+--  115dB
14:02  106  104  110  105  109dB  +----+----+----+---  108dB
14:27  124  116  119  106  117dB  +----+----+----+----+----  119dB
14:52  106#   #    #    #    #dB  +----+-   83dB#

LAVG 2 (5 MINUTE TIME HISTORY)

13:37  112  114  117  114  113dB  +----+----+----+----+--  115dB
14:02  106  104  110  105  109dB  +----+----+----+---  108dB
14:27  124  116  119  106  117dB  +----+----+----+----+----  119dB
14:52  106#   #    #    #    #dB  +----+-   83dB#

LAVG 3 (5 MINUTE TIME HISTORY)

13:37  112  114  117  114  113dB  +----+----+----+----+--  115dB
14:02  106  104  110  105  109dB  +----+----+----+---  108dB
14:27  124  116  119  106  117dB  +----+----+----+----+----  119dB
14:52  106#   #    #    #    #dB  +----+-   83dB#
```

```
SLOW MAX (5 MINUTE TIME HISTORY)

13:37  114  114  109  114  113dB  +====+====+====  114dB
14:02  106  104  110  105  109dB  +====+====  109dB
14:27  114  116  119  106  117dB  +====+====+====  114dB
14:52  106#   #    #    #    #dB  +====+=   106dB#

FAST MAX (5 MINUTE TIME HISTORY)

13:37  118  114  117  114  113dB  +====+====+====+===  118dB
14:02  106  104  110  105  109dB  +====+====  109dB
14:27  114  116  119  106  117dB  +====+====+====  114dB
14:52  106#   #    #    #    #dB  +====+=   106dB#

PEAK (5 MINUTE TIME HISTORY)

13:37  124  114  117  114  113dB  +====+====+====+====+====  124dB
14:02  106  104  110  105  109dB  +====+====+====  109dB
14:27  120  116  119  106  117dB  +====+====+====+====+  120dB
14:52  106#   #    #    #    #dB  +====+=   106dB#
                                                    Page 2
```

(STATISTICS)

```
% TIME STATISTICAL DISTRIBUTION
Weighting     A   Time Constant Slow

Total Samples     156672
Total Run        1:21:36

                          0         20        40        60        80       100
 dB    Samples   % Time   +----+----+----+----+----+----+----+----+----+----+
 99        212    0.13%   *
100       2012    1.28%   *
101       4025    2.57%   **
102      25009   15.96%   ********
103      27113   17.30%   *********
104      24666   15.74%   ********
105       8602    5.49%   ***
106       2804    1.78%   *
107      50811   32.43%   ****************
108       6298    4.01%   ***
109       3111    1.98%   *
110       1087    0.69%   *
111        460    0.29%   *
112        201    0.12%   *
113        166    0.10%   *
114         37    0.02%   *
 dB    Samples   % Time   +----+----+----+----+----+----+----+----+----+----+
                          0         20        40        60        80       100
```

When printing time history, the last row of data may be incomplete due to the study ending prior to the last interval printed. This will be indicated by #. In the example printout, the data was logged at 1 minute intervals, but combined into five minute intervals for the printout. Each row contains five five minute intervals and the average for the entire 25 minutes. The # in the last row indicates that the first value was combined from less than five logging intervals, and the average for the row , for 25 minutes, was from less than 25 minutes of complete data.

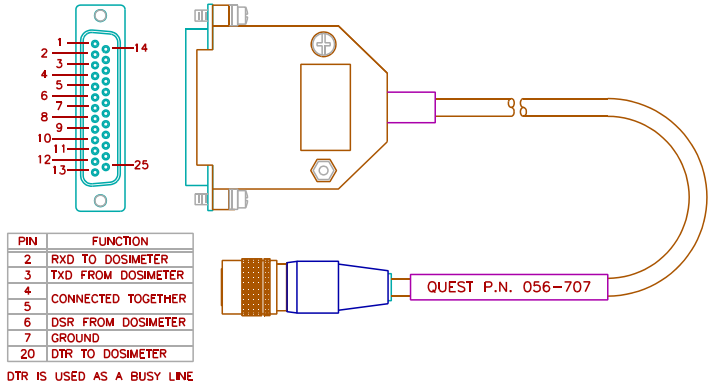


### 4.3 RS-232 Serial Interface

The jack on the top of the Q-300 provides direct connection to a computer's COM port with the serial communications cable (#056-707) provided. To connect to a serial printer or similar device, a 25-pin male to male gender changer is required.

### Serial Communications Interface

The Serial Communications Interface is compatible with most Computer COM Ports and most Serial Printers. It converts data from the Q-300 into RS-232 compatible information.




| PIN | FUNCTION |
|---|---|
| 2 | RXD TO DOSIMETER |
| 3 | TXD FROM DOSIMETER |
| 4 | CONNECTED TOGETHER |
| 5 | |
| 6 | DSR FROM DOSIMETER |
| 7 | GROUND |
| 20 | DTR TO DOSIMETER |

DTR IS USED AS A BUSY LINE

**Figure 8**. Serial Communications Interface.

The communications parameters for the ASCII data byte are the following:

1 start bit
8 data bits
1 stop bit
No parity (disabled)

Baud rate and flow control must be set the same for both the Q-300 and the RS-232 device connected to it (BAUD and FLOW as set in the Setup Menu). Refer to section 3 COMM Setup Menu.

There are three common problems when using COM ports.

1. The ports are often not labelled, making it difficult to determine which port is connected.

2. The printer output port on the computer is a 25 pin female. Adding an extra 'converter' cable to the serial cable and plugging it into the printer port will not work.

3. Often some other device, such as a mouse, is plugged into the COM port. If that is the only COM port then the mouse must be disconnected and the PC possibly must be reconfigured.

**4.4 Downloading Data**

Data stored in the Q-300 may be downloaded to a personal computer. Several methods are available.

The Quest Noise Manager software package provides an easy method of receiving data from the Q-300. Data presentation options include tabular or graphical form. In addition, remote control and access to all operating parameters is possible via an easy to use menu driven interface.

By using the RS-232 port on a PC and a communications package such as Procomm or Windows Terminal, the printout from the meter may be received and stored as a file. The Q-300 must be set for serial operation and the settings (baud rate, etc.) must match that of the PC. The serial communications cable must be connected between the meter and the PC. Pressing the PRINT key will cause the meter to print to the PC.



**Downloading Using Windows™ TERMINAL**

Microsoft® Windows™ has a communications program under the ACCESSORIES icon called **TERMINAL**. Instructions on how to use TERMINAL are located in the Windows™ manuals.

Open TERMINAL. For TERMINAL, the communications settings are found by first selecting SETTINGS, then COMMUNICATIONS. Select the desired COM (serial) port and the baud rate. The baud rate must match the BAUD selected in the Q-300's Setup Menu. TERMINAL also needs the following information in its setup:

data bits = 8 stop bits = 1
parity = none flow control = *must match the Q-300*

To save the downloaded data to a file, use the following procedure. After the communication settings are made:

1. Select TRANSFERS, then select RECEIVE TEXT FILE.

2. Enter a file name with the ending .TXT .

3. Press MENU and « on the Q-300. Prnx will appear in the Q-300's display. Press RUN/PAUSE to print.

4. When complete, Prnx will disappear from the Q-300's display. Select TRANSFERS, then STOP in the TERMINAL program.

5. Exit TERMINAL.

6. The file has been saved and can be opened with a word processor or editor such as Windows™ NOTEPAD. (Remember which directory the file was saved in. The default for Terminal is the WINDOWS directory.)

**4.5 ASCII Commands** - The following is a list of commands used to setup the Q-300 via RS-232. The display will automatically switch to the " on " display when commands are being received.

**Setup Commands** - Duplicates the setup menu functions. Omitting parameters w, x, y, or z will return the current setting. The dosimeter number should be included. Refer to Section 3.3 for details on setting the following parameters.

AOTx enables or disables Auto On feature. x = Y for enabled, x = N for disabled.

AOTSvv:ww:xx:yy:zz sets the auto on time. vv = month, ww = day, xx = hour (0 to 24), yy = minutes, zz = seconds.

BAUDxxxxx sets the baud rate for serial communications. xxxxx = 300, 600, 1200, 2400, 4800, 9600 or 19200.

CALxxxx sets the calibration SPL, where xxxx = the SPL of the calibrator (no decimal point, 1143 = 114.3dB). Set range is 900 to 1250.

PRLL sets communications for a parallel printer.

FLOWx enables or disables flow control for RS-232. x = Y for ON, x = N for OFF or no flow control

EOLxx sets the end of line character for serial communications, either carriage return, line feed or a combination of the two. xx = C, CL, L or LC where

C = carriage return and L = line feed.

ERxy sets the exchange rate. x = 1, 2 or 3 for dosimeter 1, 2 or 3. y = 3, 4, 5 or 6.

INxx sets the printout interval, where xx = 1, 5, 10, 15, 30 or 60 (Minutes)

LHx enables or disables data logging. x = Y for enabled, x = N for logging disabled.

PRNx sets the items to print. x = 0 through 7

| | Logged Data | Statistics | Events |
|---|---|---|---|
| Prn0 | Off | Off | Off |
| Prn1 | On | Off | Off |
| Prn2 | Off | On | Off |
| Prn3 | On | On | Off |
| Prn4 | Off | Off | On |
| Prn5 | On | Off | On |
| Prn6 | Off | On | On |
| Prn7 | On | On | On |



PRTx enables or disables the programmed run duration. x = Y for enabled, x = N for disabled.

PRTDxx:yy sets the programmed run duration where xx = hours, yy = minutes.

THxyyy sets the integration threshold. x = 1, 2 or 3 for dosimeter 1, 2 or 3. yyy = 40 to 140, 0 for OFF

TIMExx:yy sets the clock where xx = hours (0 to 24), yy = minutes

DATExx/yy/zzzz sets the calendar. xx = month, yy = day, zzzz = year.

CLxyyy sets the criterion level. x = 1, 2 or 3 for dosimeter 1, 2 or 3. yyy = 40 - 140.

RESPxy sets the response time. x = 1, 2 or 3 for dosimeter 1, 2 or 3. y = F or S.

ULxyyy sets the upper limit level. x = 1, 2 or 3 for dosimeter 1, 2 or 3. yyy = 40 - 140.

WGTx sets the weighting. x = A or C.

RNGx sets the measuring range. x = H for high (70-140dB), or x = L for low (40-110dB) range

PTDx sets the Projected Dose Time. x = 1 - 18 (hours)

**Security Commands** - Note: Security function SE2 does not affect the ability to change parameters via RS-232.

SEyz enables or disables the SEy security feature, where y = 1 or 2. z = Y for security ON, z = N for security OFF.

SEyzzzz sets the security code. y = 1 for SE1 or 2 for SE2. zzzz = equals the security code.

**Function Commands**

OFF turns the unit off. Caution: unit cannot be turned on via remote control. Auto On must be enabled with a valid date and time for the unit to turn on automatically.

PRINT will return the printout.

RESET clears the memory.

FACTORY clears the data memory and resets all setup menu parameters to factory settings.

## 5. GENERAL SOUND MEASUREMENT PRACTICES

Before taking measurements with the Q-300 there is a series of quick checks that should be performed. After switching the unit ON, check for the LOBAT indicator in the display. Replace the battery if needed.

Although the Q-300 will maintain accurate calibration over a long period of time, the calibration should be checked and the calibration routine run, if necessary, before each use.

When performing integrating measurements, press the RUN/PAUSE key, making sure " RUN " is indicated in the display. It is always a good idea to document all measurement conditions and meter settings for possible future needs. If the data is printed, the settings will all appear on the printout.

### 5.1 Microphone Positioning

The dosimeter measures sound most accurately without the presence of sound reflecting or absorbing objects. Any near-by object or surface (including the operator) will act as a reflector or absorber of sound. To minimize these errors, use the dosimeter as follows:

When taking Personal Noise Dosimeter Measurements:

Connect the Microphone to the shirt at the shoulder. (See Figure 9) Keep it high on the shoulder and away from the neck if possible.

If the noise seems to be coming from one location, place the microphone near the ear facing that location.

Install a Windscreen on the microphone. It holds the microphone in an upright position and keeps the microphone from brushing against clothing, which can produce high noise levels into the microphone.

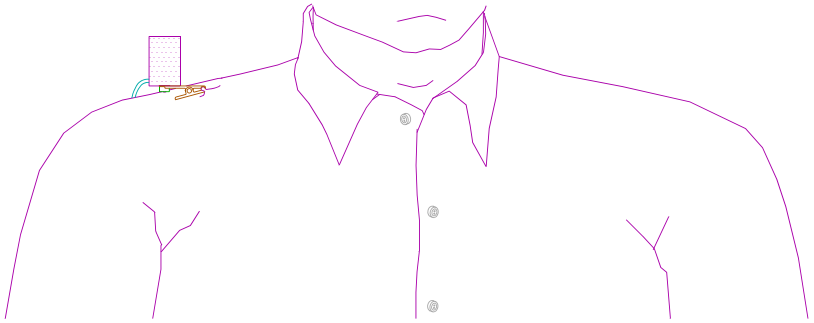


**Figure 9**. Placement of Microphone When Used as a Personal Monitor.

When taking Stand-Alone measurements:

Mount the dosimeter to the tripod mount (located on the belt clip) with the microphone upward forming approximately a 70 degree angle with the noise source.



### 5.2 Accuracy of Readings

For maximum accuracy, it is important to use the dosimeter correctly and to understand its limitations. It will correctly integrate all sound levels within the range of the instrument.

A few items related to accuracy are as follows:

There is a tendency to overestimate the accuracy of digital readings. The values (such as Leq) are computed to a precision of 0.1 dB. However, the absolute accuracy of the reading is not 0.1 dB, but is accurate to the stated overall accuracy of the instrument.

The 0.1 dB resolution is useful in determining the minimum sample time required to get an accurate short term measurement.

If, for example, the Leq is increasing 0.3 dB every second, then a longer sample time is required.

If the Leq is remaining stable from second to second within a few tenths of a dB, then the sample time is long enough.

### 5.3 Microphone Windscreen

It is recommended that a windscreen be used at all times. The Q-300 uses the WS-5 Windscreen. Using a windscreen will improve the accuracy by minimizing the effect of the following:

Wind blowing across the microphone can produce higher than normal sound level readings. The windscreen blocks wind from direct contact with the microphone, producing less unwanted noise.

Clothing brushing against the microphone can produce higher than normal sound level readings. The windscreen helps position the microphone so that clothing cannot brush against it as easily.

Dirt entering the microphone, in time, can damage the microphone, possibly changing the microphone's frequency characteristics. The windscreen catches and collects this dirt before it enters the microphone.

Simply insert the microphone into the windscreen and gently pull it over the Velcro strip.

### 5.4 Background Noise

Background noise can cause considerable error in measurement when its level is close to that of the noise source of interest. When it is not possible to eliminate or reduce the background noise, use the curve shown in Figure 10 to correct for the effect of the background noise on the measurement.

The effect of the "Noise Floor" on low level readings can cause inaccurate data. In a "Perfectly Quiet" room, the electrical noise produced by the microphone is approximately 35 dB on A weighting or 45 dB on C weighting.

Measurements must always be at least 5 dB above the "Noise Floor". to be valid. Therefore, the lowest possible measurements of the dosimeter are approximately:

40 dB on "A" Weighting (Lowest Valid Reading).

50 dB on "C" Weighting (Lowest Valid Reading).

## 6. TECHNICAL INFORMATION

### 6.1 Principles of Operation

The Q-300 dosimeter uses low power state-of-the-art circuitry. The dosimeter is very stable and reliable over a wide range of environmental conditions.

The low power circuitry gives the dosimeter a long battery life. When the 9 volt battery is changed, all dosimeter information is retained due to an internal lithium battery. The lithium battery lasts for many years before needing replacement. (See SPECIFICATIONS)

A rubber Key Pad is used for all data entry and settings. Menus appear on the display and the keys are used to enter changes.

A block diagram of the Q-300 is shown in Figure 11.

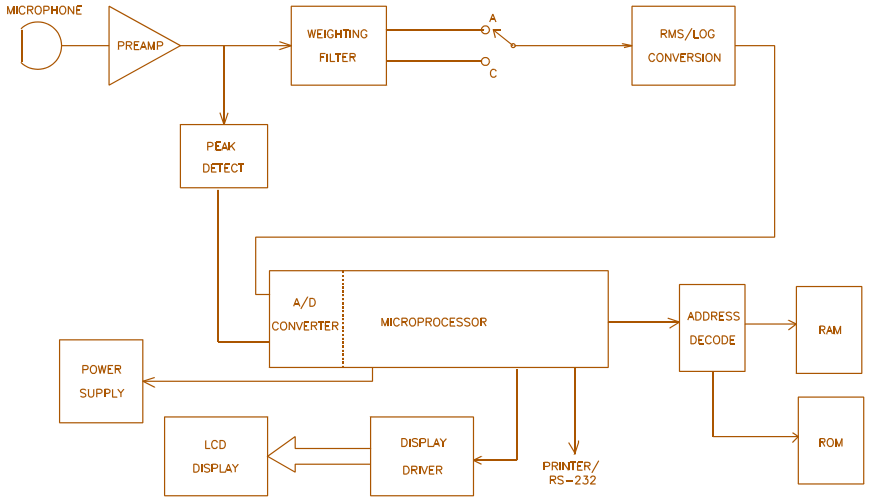



**Figure 10**. Block Diagram of the Q-300



### 6.2 Microphone Characteristics

The Q-300 Noise Dosimeter uses an 8 mm omnidirectional ceramic microphone. It is buffered by a high impedance FET input stage. (See Figure 12.)

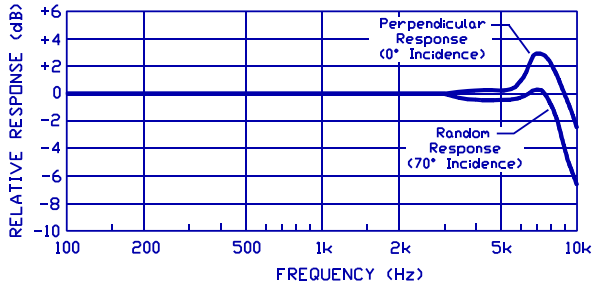



**Figure 11**. Q-300 Microphone Frequency Response.

### 6.3 Weighting Characteristics

The Q-300 has "A" and "C" weighting characteristics as shown in Figure 13. For most industrial and community noise measurement requirements, the "A" weighting should be used. The "A" weighting has a response similar to the human ear. The "C" weighting is used for measuring noise reduction in hearing protectors and other scientific purposes. Peak measurements are made with the Linear, or Flat frequency weighting.

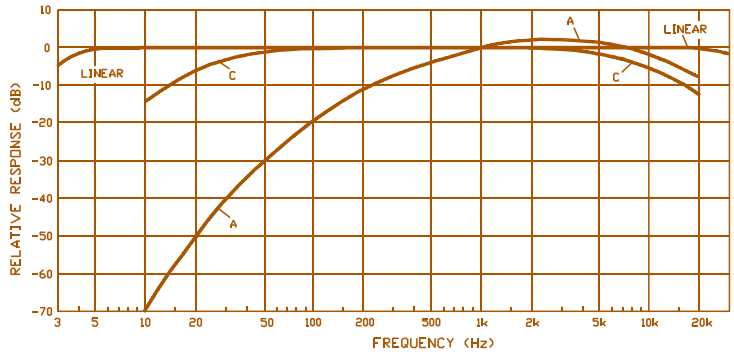



**Figure 13**. Weighting Characteristics



### 6.4 Tone Burst Response

Figures 14 and 15 show the meter's tone burst response to sinewave inputs of varied burst duration. The available time constants are:

SLOW RESPONSE
(1000 msec time constant)
Decay Rate:
4.35 dB per second.

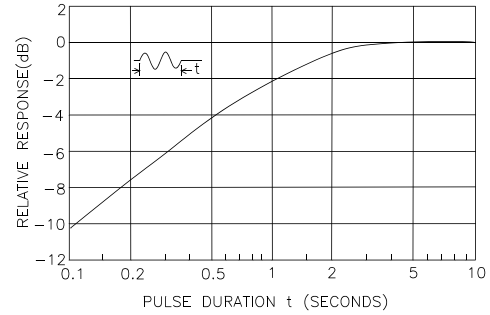



**Figure 14**. SLOW Response

FAST RESPONSE
(125 msec time constant)
Decay Rate:
29 dB per second.

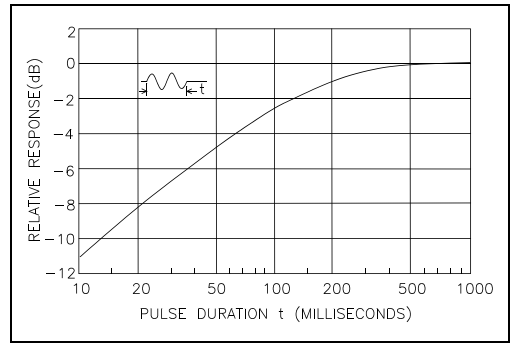



**Figure 15**. FAST Response

## 7. SPECIFICATIONS

| | |
|---|---|
| Standards: | ANSI S1.25 - 1991, ANSI S1.4 - 1983: Type 2<br>IEC 651 - 1979, IEC 804 - 1985: Type 2<br>IEC 1252 - 1993 |
| Measuring Range: | 40 - 110dB or 70-140dB. Maximum level is for sinusoidal signals. A signal with a 10dB crest factor will be measured accurately if its RMS level is 10dB below the maximum level for the range. Peak detector range is 70-114dB or 100-144dB. |
| Detector: | True RMS, 63dB Pulse Range |
| Data Output: | Requires Interface Modules connected to the microphone connector.<br>Parallel operation or Selectable Baud:<br>300 600 1200 2400 4800 9600 19200. |
| Microphone: | 8mm Shoulder-Mount, Type 2. One piece system:<br>Cable, Connector, and Microphone |
| Battery: | Single 9-volt alkaline provides approximately 48 hours of operation |
| Integration Time: | Signal dependent: With a 3dB Exchange rate and a signal level of 140dB the integration time would be 62 hours. As the signal level decreases and the exchange rate increases, the time increases to 145 hours maximum. |

Memory and Clock/Calendar Battery Backup: Lithium cell, 1 to 2 year life not including time that the 9 volt battery is installed.

| | |
|---|---|
| Temperature: | -10° to +50°C operating; -20° to +60°C storage (battery removed) |
| Humidity: | 0 to 95% non-condensing |
| Electromagnetic Field Effects: | Negligible below 50 Oersteds at 50 to 60 Hz.<br>Tested for RF succeptibility with <1dB error at field strengths to 10 V/m over the frequency range of 10 MHz to 500 MHz. |
| Size: | 5.5 x 2.8 x 1.4 inches (140 x 70 x 40 mm) |
| Weight: | 15.5 oz. (440 grams) |
| Construction: | Cast aluminum housing with security cover. |

Note: Specifications subject to change.



## 8. ACCESSORIES

56-963 8mm Shoulder-Mount Dosimeter Microphone, Type 2. One piece system including Cable, Connector, and Microphone

58-852 Earloops to hold microphone at the ear, package of 10.

56-830 Clothing Clips, package of 5, for microphone cable.
58-452 WS-5 Windscreen, (8mm I.D.), package of 10.

**Data Interface Modules**

56-957 Parallel Printer Interface, Centronics Compatable

56-707 Serial Communications Interface
25-pin, RS-232 Female

56-841 Direct Input Cable for electrical signal input

**Printer**

56-022 80 Column Parallel Printer, 110 volt only.

**Power Supplies**

56-973 AC/DC Adapter, inserts into battery compartment.
Uses the MODEL 920 AC Power Supply, not included, or various other power sources.

56-067 MODEL 920 AC Power Supply, 120 VAC to 9 VDC

**QuestSuite for Windows Software**

QuestSuite for Windows (3.1 or Windows 95) provides the ability to download data from the Q-300 and save the data for future reference. Remote setup of measuring parameters, graphing capabilities and report generation as well as the ability to work with Quest heat stress monitors, gas monitors and sound level meters make the QuestSuite a valuable tool for industrial hygiene work. Specify the Q-series dosimeter applet for use with the Q-300.

**Calibrators**

056-981 QC-10 Calibrator; 114dB at 1000 Hz Output

056-982 QC-20 Calibrator; Selectable 94dB or 114dB at 250 Hz or 1000 Hz Output

56-989 Calibrator Adapter, 8 mm to 1 inch coupler.
Fits QC-10 and QC-20.

58-839 Calibrator Adapter, 8 mm to 1 1/8 inch coupler. Fits older Quest Calibrators models CA-12, CA-15, CA-22 and CA-32.

**Tripods**

59-045 TP-1 Tripod
Large - will not fit into carrying cases.

59-046 TP-2 Tripod
Small - will fit into some carrying cases.

**8.1 Using The Microphone Boom**

The microphone can be mounted on the microphone boom. This makes the dosimeter easier to use when hand-held or tripod-mounted.

The microphone boom attaches to the back of the dosimeter as follows:

1.) Connect the microphone to the microphone boom in one of the following ways:

Clip the microphone to the microphone boom.

Unscrew the microphone clip from the microphone and screw the microphone boom to the microphone.

2.) Carefully wind the cable onto the upper portion of the microphone boom.

3.) Insert the microphone boom pin into the center hole on the belt clip.

4.) Fasten the bottom of the microphone boom to the belt clip with the microphone boom thumbscrew.

The exposed end of the microphone boom thumbscrew is threaded so that a tripod can be connected to it.



**8.2 AC/DC Adapter Installation**

Quest part number 056-973

The dosimeter can operate from one of the following power sources if desired:

Any AC power source (9 to 18 VAC, 35 mA minimum)
(Such as the Quest Model 920 AC Power Supply)

Any DC power source (12 to 24 VDC, 35 mA minimum)
(The polarity of the DC Plug does not matter.)

The power source must have a 3.5mm (1/8") phone plug.

Simply install the AC/DC adapter into the dosimeter battery compartment in place of the battery as follows:

Remove the battery from the battery compartment as follows:

1.) Remove the battery cover. (See Figure 4.)

2.) Lift the non-terminal end of the battery out of the battery compartment.

3.) Remove the battery.

Install the AC/DC Adapter as follows:

1.) Position the dosimeter so that the battery compartment is facing upwards.

2.) Snap the AC/DC adapter into the dosimeter.

3.) Plug the desired power source (see above) into the AC/DC adapter jack.

The dosimeter is now ready for operation.

Note: Safety approvals for dosimeter use in hazardous locations are for battery operation only. Do not use the AC/DC adapter in an environment classified as hazardous by the local electrical code or governing agency.

## 9.0 TROUBLESHOOTING

Blank display when the **ON/OFF** key is pressed:

Replace the battery with a known fresh battery.

Unit does not calibrate:

Check for LOBAT indicator. Battery must check OK.

Check the Calibrator; Listen for a tone from its output.

Reset the dosimeter and try again.

Try a different microphone if you have another dosimeter. If this works, the microphone needs replacing.

Return for service.

Unit is erratic:

Try a different microphone if you have another unit. (The microphone or preamp could be intermittant.)

Return for service.



## APPENDIX

### Definitions

All definitions are in reference to the Q-300 dosimeter.

**BAUD**: **Baud Rate**
The rate of data transfer, in bits per second, between the dosimeter and a printer or computer in the serial output mode.

**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.)

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

**EOL**: **End of Line Character**
These are printer instructions that can be placed at the end of each line of type in the printout. The dosimeter can be programmed to send Line Feed (LF) and Carriage Return (CR) instructions.

**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.)

**EVENT**: Each measurement time that the dosimeter is in the Run mode.

**EXP**: **Exposure**
A method of measuring dosage, in Pascal Squared Hours. $Pa^2H$ is a linear unit rather than a percentage.

1 Pascal is equal to 94 dB. 94 dB for 1 Hour equals 1 $Pa^2H$.

Examples of the 94 dB/time relationship:

94 dB for 1 Hour = 1.00 $Pa^2H$
94 dB for 8 Hours = 8.00 $Pa^2H$

The accumulation of $Pa^2H$ will double (or halve) for every 3 dB of change from 94 dB as follows:

97 dB for 1 Hour = 2.00 $Pa^2H$
94 dB for 1 Hour = 1.00 $Pa^2H$
91 dB for 1 Hour = .50 $Pa^2H$
88 dB for 1 Hours = .25 $Pa^2H$
85 dB for 1 Hours = .125 $Pa^2H$

1 $Pa^2H$ is typically the maximum allowable Exposure.

85 dB for 8 Hours = 1 $Pa^2H$

**FAST**: **Fast Response**

A Measurement Time Constant, or averaging time, of 125 milliseconds. When Fast is used, SPL will closely track a fluctuating noise source.

**LAVG**: **Average Level**

The average sound level, in decibels, for the measurement period based on either a 4, 5, or 6 dB Exchange Rate (ER). If the Exchange Rate (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 Exchange Rate (ER).

If the Exchange Rate (ER) is 4, 5, or 6 dB, then LEQ becomes LAVG.

**MAX**: **Maximum Level**

The highest sound pressure level, in decibels, that occurs during a given time period.

**MIN**: **Minimum Level**

The lowest sound pressure level, in decibels, that occurs during a given time period.

**PEAK**: **Absolute Unweighted Peak**

The highest instantaneous sound pressure, in decibels, that occurs during a given time period.

**PDOSE**: **Projected Dose**

A percentage computed by measuring dose for some time period and extrapolating it to a different time period.
(Example: 50% Dose / 4 hrs = 75% Projected Dose / 6 hrs)

**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.

SEL is usually measured with a 3 dB Exchange Rate. However, the dosimeter will also allow SEL to be measured with 4, 5, or 6 dB Exchange Rates. On a printout, the exchange rate is shown in parenthesis.

**SLOW**: **Slow Response**

A Measurement Time Constant, or averaging time, of 1 second. When Slow is used, SPL will not track a quickly fluctuating noise source, but will produce an averaged reading.

**SPL**: **Sound Pressure Level**

A quantity in decibels equal to the sound pressure divided by 20 uPa (0.00002 $N/m^2$), times 20. The word "Level" indicates that the sound pressure is a certain level above the reference level. The SPL is displayed each second as the



maximum value (Slow or Fast Response) for the previous 1 second period.

**STATISTICS**: **% Time Statistical Distribution**

For a given run time, the percentage of time that a sound level occured at a specific dB level.

**TIME HISTORY**: **Time History**

A Printout list (and Graph) showing how levels were accumulated over time. A printout can be made for each of the following: Lavg, Lmax, and Peak.

**TL**: **Threshold Level**

A preset level in decibels below which sound is not accumulated or averaged into LAVG, LEQ, or Dose.

**TWA**: **Time Weighted Average**

The sound level in decibels that is accumulated for any time period but with its average level computed over an 8 hour time period.

- If the time period is less than 8 hours, the Time Weighted Average will always be less than the Average Sound Level (LAVG).
- If the time period is more than 8 hours, the Time Weighted Average will always be more than the Average Sound Level (LAVG).

TWA is usually measured with A Weighting, Slow Response, and a 5 dB Exchange Rate. However, the dosimeter will allow A or C-Weighting, Slow or Fast Response, and a 3, 4, 5, or 6 dB Exchange Rate.

**UL**: **Upper Limit Time**

The total time that the sound level exceeds a preset level.

**Typical Setups**

OSHA NOISE COMPLIANCE

| | |
|---|---|
| Threshold = 90dB | Exchange Rate = 5dB |
| Weighting = A | Response = Slow |

OSHA HEARING CONSERVATION

Same as above except with Threshold = 80dB

DEPARTMENT OF DEFENSE NOISE COMPLIANCE

| | |
|---|---|
| Threshold = 80dB | Exchange Rate = 4dB |
| Weighting = A | Response = Slow |

IEC NOISE MONITORING

| | |
|---|---|
| Threshold = OFF | Exchange Rate = 3dB |
| Weighting = A | Response = Slow |

**Acoustical Formulas**

The Q-300 uses the following formulas to calculate the accumulated data:

$$Dose = \frac{100}{TC}\left[\int_0^{RTIME} 2^{(LS-CL)/ER}\, dt\right]$$

$$PrD_{8\ HOURS} = DOSE \times \frac{TC}{RTIME}$$

$$PrD_{x\ HOURS} = DOSE \times \frac{Prt}{RTIME}$$

$$L_{AVG} = ER\left[LOG_2 \int_0^{RTIME} 2^{LS/ER}\, dt - LOG_2(RTIME)\right]$$

$$L_{EQ} = 3.01\left[LOG_2 \int_0^{RTIME} 2^{LS/3.01}\, dt - LOG_2(RTIME)\right]$$

$$SEL = ER\left[LOG_2 \int_0^{RTIME} 2^{LS/ER}\, dt\right]$$

$$TWA = ER\left[LOG_2 \int_0^{RTIME} 2^{LS/ER}\, dt - LOG_2(TC)\right]$$

$$Pa^2H = \left[2^{(L_{EQ}-94)/3.01}\right]\frac{RTIME}{3600}$$



$$LHIST = ER\left[LOG_2 \int_0^{HTIME} 2^{LS/ER}\, dt - LOG_2(HTIME)\right]$$

$$\%\ TIME\ STAT\ DIST = 100 \times \frac{SC}{TS}$$

**Where:**

LS = Sound Level in dB with the selected Time Constant (Slow or Fast). Its value is entered only if the Sound Level is greater than the Threshold Level. Otherwise, it is entered as minus infinity.

TC = 8 Hour Criterion Time. Enter 28800 seconds.

RTIME = Run Time in seconds.

ER = Exchange Rate in dB. (Selectable 3, 4, 5 or 6 dB)

CL = Criterion Level in dB. (Selectable 40 to 140 dB)

LHIST = Integrated Level stored either in 1 second, 10 second, or 1 minute periods based on the programmed Logging setup.

HTIME = Time (in seconds) used to compute Time History. (Selectable: 1 second, 10 seconds, or 1 minute.)

SC = Sample Counts. The number of samples occurring at the same dB level.

TS = Total Samples. The total number of samples during the Run Time.

Prt = Projection Time in seconds.

For definitions of the following:

DOSE, CL, LAVG, PrD (Projected Dose), ER, LEQ, TWA, $Pa^2H$ (Exposure), SEL, % TIME STAT DIST

See APPENDIX, Acoustical Definitions.

## QUEST SERVICE AND WARRANTY POLICY

### Service Policy

The Quest product you have purchased is one of the finest acoustic instruments available. It is backed by our full one year warranty which seeks complete customer satisfaction. This is your assurance that you can expect prompt courteous service for your equipment from the entire Quest service organization.

Should your Quest equipment need to be returned for repair or recalibration, please contact the Service Department at 1(800)245-0779 (USA) or Fax (262)567-4047 for a Return Authorization Number. The RA number is valid for 30 days, and must be shown on the shipping label and purchase order/cover letter. If you are unable to return instruments in that time call for a new RA number. Send it prepaid and properly packed in the original shipping carton directly to Quest Technologies,1060 Corporate Center Dr., Oconomowoc, WI 53066 U.S.A..

Repair or replacement work done under warranty will be performed free of charge, and the instrument will be returned to you prepaid. Your copy or a photocopy of the Quest Registration Card will serve as proof of warranty should the factory require this information.

If for any reason you should find it necessary to contact the factory regarding service or shipping damage, please direct your calls or letters to the attention of the Service Manager, Quest Technologies, (262) 567-9157 or (800) 245-0779. Office hours are from 8 AM to 5 PM (Central Standard Time) Monday through Friday.

### Warranty

Quest Technologies warrants our instruments to be free from defects in materials and workmanship for one year under normal conditions of use and service. For U.S.A. customers we will replace or repair (our option) defective instruments at no charge, excluding batteries, abuse, misuse, alterations, physical damage, or instruments previously repaired by other than Quest Technologies. Microphones, sensors, printers and chart recorders may have shorter warranty periods. This warranty states our total obligation in place of any other warranties expressed or implied. Our warranty does not include any liability or obligation directly resulting from any defective instrument or product or any associated damages, injuries, or property loss, including loss of use or measurement data.

For warranty outside the U.S.A., a minimum of one year warranty applies to the same limitation and exceptions as above with service provided or arranged through the authorized Quest sales agent or our Quest European Service Laboratory. Foreign purchasers should contact the local Quest sales agent for details.