instructions for

Models 1700 and 2700

Sound Level Meters

and

Models OB-50 and OB-100

Octave Band Filter

and

Model OB-300

1/1 - 1/3 Octave Band Filter

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.

59-334 Rev D
4/97

TABLE OF CONTENTS
MODEL 1700 PRECISION IMPULSE SOUND LEVEL METER
AND MODEL 2700 IMPULSE SOUND LEVEL METER
WITH THE OB-50, OB-100 AND OB-300

I. INTRODUCTION TO THE MODELS 1700 AND 2700

The Quest Models 1700 and 2700 Impulse Sound Level Meters are general purpose instruments designed for sound pressure level measurements with or without the use of optional bandpass filters. The Model 1700 delivers Type 1 accuracy, while the model 2700 provides Type 2 accuracy for general survey work. Applications include laboratory, industrial, community and audiometric measurement and analysis. Since the operation of the 1700 and 2700 are virtually identical, this manual will refer to the model 1700. Differences between the two models will be detailed as appropriate.

The Model 1700 is a user-friendly hand held meter with an LCD display that provides a numerical and bar graph readout. It is housed in a tough injection molded plastic case with internal shielding against external electromagnetic interference. The meter is operated with easy-to-use slide switches and push buttons. Two output jacks are provided for connecting to external peripherals such as chart recorders, oscilloscopes, tape recorders, etc.

Plug in the Model OB-300 combination 1/3 - 1/1 Octave Filter Set and create a 1/3 or 1/1 octave band analyzer covering 33 bands from 12.5 Hz to 20 kHz. The addition of the Model OB-100 Octave Filter Set will create an octave band analyzer covering 10 bands from 31.5 Hz to 16 kHz. The Model OB-50 Octave Filter Set covers 9 bands from 31.5 to 8kHz.

If sound measurements need to be made from a distance, simply remove the microphone preamplifier and insert an extension cable. Cable distances of up to 100 feet can be accommodated.

With the microphone and preamplifier removed, the meter can accept other input devices such as the Quest Model VI-90 Vibration Integrator. The VA-508C Vibration Assembly, combined with the Model 1700, provides a quick and precise method of measuring and analyzing many types of industrial vibration.

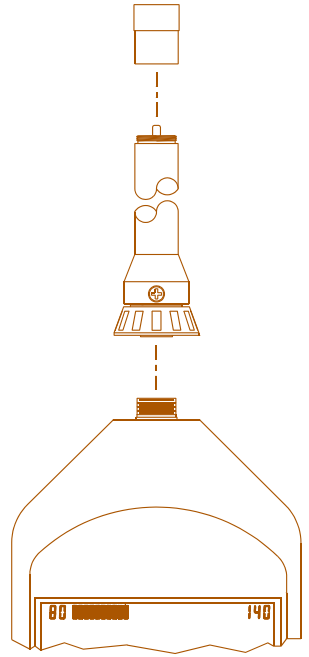


Figure 1 Preamp Assembly

A. Assembling the Meter

The microphone and preamplifier must be assembled prior to making any measurements.

Microphone Handling and Storage

The microphones used with the model 1900 will provide years of reliable use, but certain precautions should be followed with regard to handling and storage.

1. Never remove the microphone grid. This will expose the diaphragm, making it susceptible to physical damage. When removing a microphone from the preamplifier be careful not

to unscrew only the grid.

2. Never touch the diaphragm.

3. Electret (prepolarized) microphones should never be stored at high temperatures, as long term degradation of the polarization charge may occur. This results in a decrease in microphone sensitivity.

4. An electret microphone should be stored in its protective box when not in use for long periods of time.

To attach the microphone to the preamplifier, screw the microphone onto the threaded end of the preamplifier. Attach the preamplifier to the meter by placing the connector ends together and rotating the preamplifier until it drops onto the meter. Finger tighten the black locking ring by screwing it onto the meter.

II. ABOUT THE METER

A. The Display

The LCD display contains both a numeric readout and a quasi-analog bar indicator along with BAT (battery), HLD (hold), and OL (overload) indicators. The rate at which the numeric display is updated depends upon the setting of a switch which is located in the battery compartment. Either a one-second or a one-quarter second display rate can be selected.

The bar indicator portion of the display will indicate the current SPL (Sound Pressure Level), except when the BATTERY button is pressed. (See III. A., Battery Check). When using the bar indicator for SPL, the 0 to 60 range of the bar indicator represents the range indicated by the setting of the Range switch. If on the 80 to 140 range, for example, the bar indicator represents 80 to 140 dB.

The MODE switch selects either SPL or MAX for display. Sound levels are shown to the nearest 0.1 dB.

B. Meter Controls

HOLD Button

When the HOLD button is depressed, the current numeric value in the display (either SPL or MAX) is frozen and the HLD annunciator appears in the display. The last stored values of SPL and MAX can be viewed. Simply use the MODE switch to select the value of interest. Pressing HOLD will NOT stop the MAX value from updating if a higher value should occur. It simply saves the current value for viewing.

HOLD is a toggle function. To exit the HOLD mode, simply press HOLD again.

RESET Button

To reset the MAX value stored in the Model 1700, press the RESET button. This will erase the MAX value prior to taking new readings. The RESPONSE must be set to either SLOW, FAST, or IMP for the MAX reset to occur.

NOTE: Pressing RESET while the RESPONSE is set to PEAK only resets PEAK. The MAX value is unaffected.

BATTERY Button

Pressing the BATTERY button will indicate relative battery strength in the bar portion of the display. This button may be pressed at any time without affecting the meter signal processing. (See III. A., Battery Check)

RESPONSE Switch

The RESPONSE switch controls the rate at which the meter responds to changing input signals. Most sound measurements are done with the response set to SLOW. The FAST response is generally used when measuring short duration noises such as moving vehicles. PEAK is generally used to capture very rapidly rising, extremely short duration signals (gun shots, etc.).

The RESPONSE switch positions are as follows:

SLOW - 1 second time constant. (See Figure 18.)

FAST - 125 millisecond time constant. (See Figure 19.)

PEAK - 50 microsecond rise time constant with the peak sound level being captured and held until the RESET button is pressed. (See Figure 20.)

NOTE: Pressing RESET while in the PEAK response will not clear out the MAX level.

IMPulse - 35 millisecond rise time constant with a decay rate of 2.9 dB/sec. (See Figures 21 and 22.)

WEIGHTING Switch

The WEIGHTING switch controls the frequency response of the meter. Weightings A, B, C, or LINear (flat) may be selected. (See V. G., Weighting Characteristics for further information.)

MODE Switch

The MODE switch selects either the instantaneous sound pressure level (SPL) or the maximum sound pressure level (MAX).

SPL - Sound Pressure Level will be displayed. (SPL is also always shown in the display bar indicator.)

MAX - The Maximum Sound Pressure Level obtained (starting from the last time that the meter has been reset) is shown in the numeric display.

dB RANGE Switch

The displayed range of the Model 1700 is 60 dB and is switchable between the following: 20-80 dB, 40-100 dB, 60-120 dB, or 80-140 dB.

POWER Switch

This switch turns the power to the meter ON and OFF.

C. Overload Detection

In the SPL mode, the overload indicator (OL) is displayed whenever the incoming signal is of too high a level for the circuitry to accurately measure. It appears as OL in the upper right-hand corner of the display. If the OL indicator is on, increase the setting of the dB RANGE switch until the OL condition is removed causing OL to disappear.

D. Output Jacks

All output jacks use a 3.5mm stereo plug. (See Figure 2)

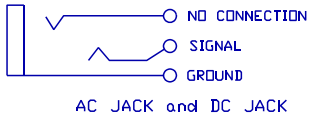


Figure 2. Output Jack Connections

The functions of the output jacks are as follows:

DC - The weighted and time averaged Sound Pressure Level (SPL) over the selected 60 dB range is linearly represented by a 0 to 1 volt DC output. Zero volts is equal to the bottom of the range and 1 volt is equal to full scale. This output is provided for connecting to a 0 to 1 volt full scale chart recorder or a data acquisition device that accepts DC voltages. (See IV. D., Chart Recording and Figure 6, Chart Recording of SPL)

AC - This jack furnishes an amplified version of the AC signal from the microphone which is frequency weighted according to the WEIGHTING switch setting. The full span of 60 dB is represented between 3.16 millivolts and 3.16 volts RMS.

E. Internal Switches

There is an internal switch located in the battery compartment that is accessible to the user. (Refer to Figure 3)

Mic. Polarization - The small ON/OFF switch on the right-hand side operates the 200 volt microphone polarization voltage which is necessary for air-condenser microphones. (Model 1700 only)

Display Time - The recessed dip switch controls the rate at which the display updates. The options are 1.0 second or 0.25 second.

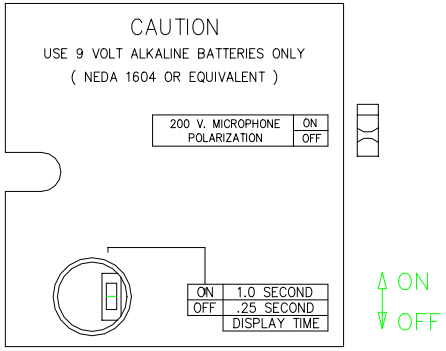


Figure 3. Battery Compartment Internal Switch

III. CHECKING THE METER INTEGRITY

A. Battery Check

At any time, the BATTERY push button can be pressed to get an indication of battery strength. The weaker of the two 9 volt batteries is shown on the bar indicator of the Model 1700's display. Good batteries will be indicated with the bar extending well beyond the indicating arrow (5 on the 0-60 scale). If the bar falls below the indicating arrow, then **BOTH ALKALINE** batteries must be replaced. Because erroneous readings will occur if the battery check registers below the indicating arrow, it is good practice to perform a battery check before using the 1700. The stored MAX value and the AC and DC outputs are NOT affected by performing a battery check.

B. Calibration

To check the calibration of the Model 1700, perform the following procedure using a Quest Calibrator.

1. Perform a battery check.
2. Turn the Calibrator ON and note the level specified on the label. If the calibrator output is at a frequency other than 1kHz, corrections to the calibration value may be necessary if calibrating with the meter set to A, B or C weighting.
3. If an adapter is needed to mate the microphone size to the calibrator coupler, insert it fully into the calibrator.
4. Place the Calibrator (with adapter, if used) fully onto the microphone.
5. Set the Model 1700 to LIN, SLOW or FAST, the SPL mode, and the 60-120 range (if using a level of 94 dB).
6. Use a small screwdriver to adjust the calibration potentiometer, located through the small hole on the left side of the meter, until the display matches the calibration level.

NOTE: Most Calibrators (including Quest 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 the Calibrator Manual for correction factors at different altitudes and how to apply them.

IV. GENERAL OPERATING CONSIDERATIONS

Before taking measurements with the Model 1700, there is a series of quick checks that should be performed. After switching the unit ON, the batteries should be checked (and replaced if needed). Although the Model 1700 will maintain accurate calibration over a long period of time, the calibration should be checked and the meter adjusted, if necessary, before each use.

Set the RESPONSE, WEIGHTING, MODE, and dB RANGE switches as needed. Hold, set, or tripod mount the meter in the desired location. If a MAX measurement is needed, reset the meter before taking the measurements. It is always a good idea to document all measurement conditions and meter settings for possible future needs.

A. Meter / Microphone Placement

Whenever possible, the meter should be tripod-mounted in an open area to minimize reflections from the body or other large reflective structures. Avoid placement against a wall or in a corner. If reflections are of concern, a microphone extension cable may be used for better microphone placement.

When using a random incidence or pressure microphone, point it approximately 70 degrees to the direction of the sound. If using a free-field microphone, point it directly at the noise source.

B. Background Noise

Background noise can cause considerable error in measurement when its level is close to that of the sound source of interest. When it is not possible to eliminate or reduce the background noise, use the curve shown in Figure 4 to correct for the effect of the background noise on the measurement.

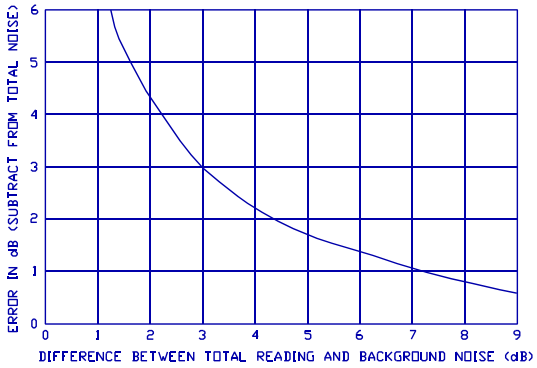


Figure 4. Effect of Background Noise on Measurement

C. Wind Screen Effects

To prevent measurement errors due to noise caused by wind blowing across the microphone, the use of a windscreen is recommended. The wind screen will reduce wind effects and will also help protect the microphone under dusty, oily, or humid conditions. Acoustic attenuation effects of the one-half inch (WS-7) and the one inch (WS-3) windscreen are shown in Figure 5.

D. Chart Recording

The Model 1700 has a DC output that is linearly related to the 60 dB LCD analog bar movement as follows:

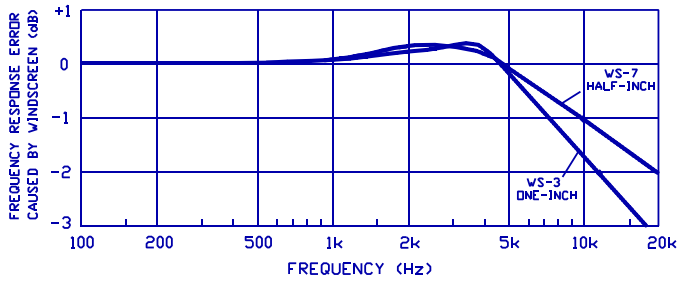


Figure 5. Acoustic Effect of Windscreens

Analog Bar (dB)	0	10	20	30	40	50	60
DC Output (V)	.00	.17	.33	.50	.67	.83	1.00

This output, capable of driving up to 100 feet of shielded or twisted pair cable, is intended for use with a 0 to 1 volt DC input chart recorder that has an input impedance greater than 20K ohms.

Refer to Figure 6, Chart Recording of SPL. Connect the Model 1700 to the chart recorder input with proper polarity such that the pen is on the proper side of the chart paper with respect to time and that the pen moves in the proper direction with increasing dB level. Use a 1 kHz acoustic calibrator, preferrably 94 dB, (dB level is specified on calibrator) to calibrate the chart recorder as follows:

1. Turn the meter to ON. Set the meter RESPONSE to FAST, WEIGHTING to A, MODE to SPL, and dB RANGE to 80-140.

NOTE: If an adapter is needed to mate the microphone size to the calibrator coupler, insert it fully into the calibrator.

2. Place the calibrator (with adapter, if used) fully onto the microphone - do not turn the calibrator on yet. The meter shall read less than 80 dB which generates .00 volts DC out to the chart recorder. Adjust the zero control on the recorder so that the pen represents a relative dB of 0.

3. Turn the Calibrator ON to produce 94 dB (or the level specified on the label) at 1 kHz. Set the 1700 dB RANGE for the highest bar graph level without causing an overload. The recorder pen should rise to the correct RELATIVE dB. (54 if the calibrator level is 94 dB and the dB RANGE is set to 40 to 100.) A small adjustment may be needed. Use the zero adjust to do this.

4. Be sure to document all chart recorder settings and meter settings when taking measurements.

Note that any range position can be set on the Model 1700 and the 60 dB span of the meter range will always correspond to the full 60 dB range on the chart recorder.

Use QUEST CHART PAPER # 58-653.

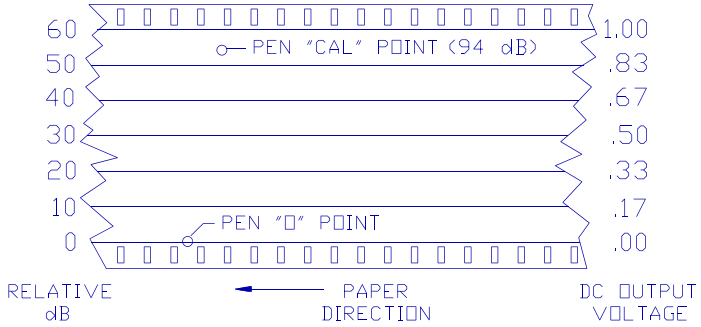


Figure 6. Chart Recording of SPL

V. TECHNICAL INFORMATION

A. Principles of Operation

The Quest Model 1700 utilizes low noise, low power analog and digital integrated circuitry to ensure long battery life, maximum stability, and superior reliability over a wide range of environmental conditions. Figure 7 is a block diagram of the Model 1700's internal circuit operations.

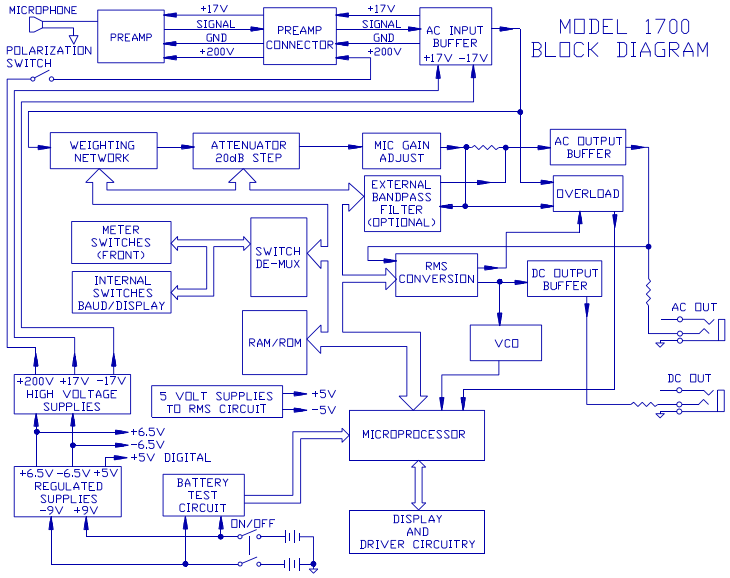


Figure 7. Block Diagram of the Models 1700 and 2700

B. Microphone (model 1700)

The Model 1700 is designed to accept either a half-inch or one-inch condenser microphone of either prepolarized (electret) or air-condenser type. The prepolarized microphone does not require a polarization voltage. If the air-condenser type is used, then the 200 volt microphone polarization voltage must be turned on by a switch located in the battery compartment. (Sec II. Figure 3., Internal Switches.)

CAUTION: Be careful not to turn on the 200 volt polarization switch if a prepolarized (electret) microphone is attached. The microphone may be damaged.

The microphone screws directly onto the preamp which, in turn, connects directly to the meter. The preamp converts the high output impedance of the microphone into a low output impedance. This allows the microphone to drive up to 100 feet of cable for remote operation.

Typical microphones used on the 1700 include the following:

Model QE4146	1/2-inch free-field,	prepolarized condenser (electret), 40 mv/Pa
Model QE4170	1-inch pressure,	200 Volt polarization, 50 mv/Pa
Model QE4160	1/2-inch pressure,	200 Volt polarization, 50 mv/Pa
Model QE4150	1/2-inch free-field,	200 Volt polarization, 50 mv/Pa
Model QE4140	1/2-inch pressure,	200 Volt polarization, 16 mv/Pa

Typical microphone response curves for the Models QE4146 and QE4170 are shown in Figures 8 and 9 respectively.

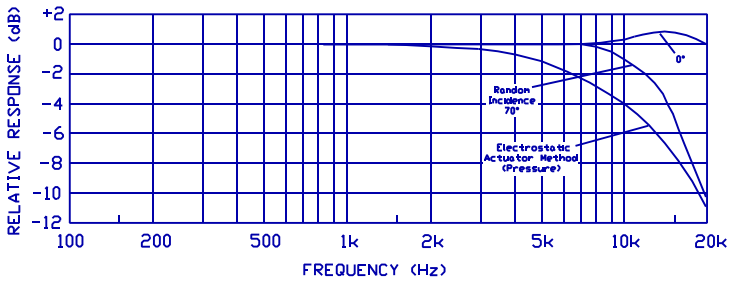


Figure 8. Typical Frequency Response - Model QE4146 Microphone

C. Preamplifier Input Characteristics

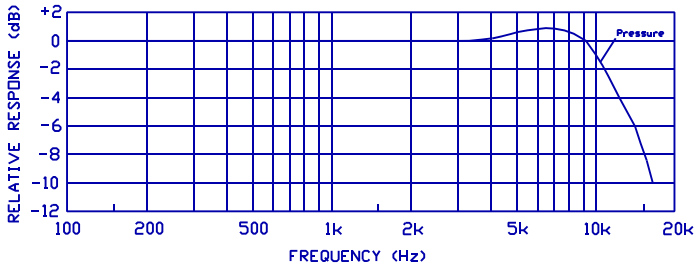


Figure 9. Typical Frequency Response - Model QE4170 Microphone

The input impedance of the preamp affects both the low frequency response and the microphone attenuation as shown in Figures 10 and 11. The approximate microphone capacitances for the 1/2 inch and one inch microphones are 18pf and 60pf respectively. The preamp is removable by turning the black plastic collar below the preamp housing counter-clockwise when viewed from the top of the meter.

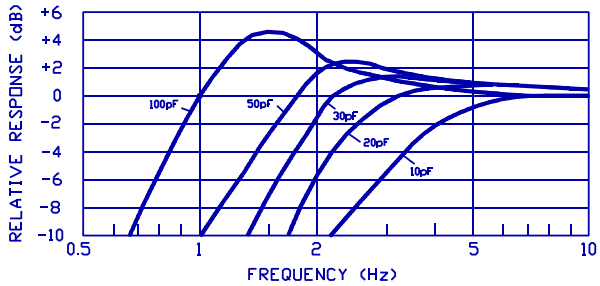


Figure 10. Effect of Microphone Output Capacitance on Preamp Low Frequency Response

D. Microphone (model 2700)

The model 2700 is designed to accept a prepolarized (electret) microphone, Model QE7052. The impedance of this microphone is 18pF. The microphone screws directly onto the preamplifier, model 056-852. Typical response for the QE7052 is shown in Figure 12.

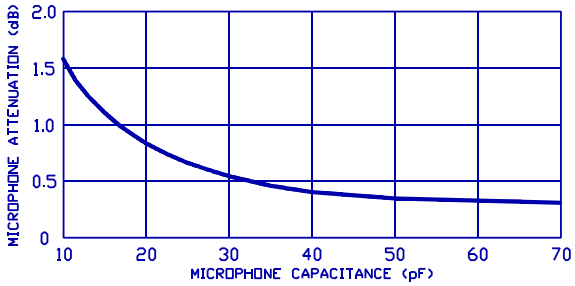


Figure 11. Microphone Output Attenuation Caused by Input Capacitance of Preamp

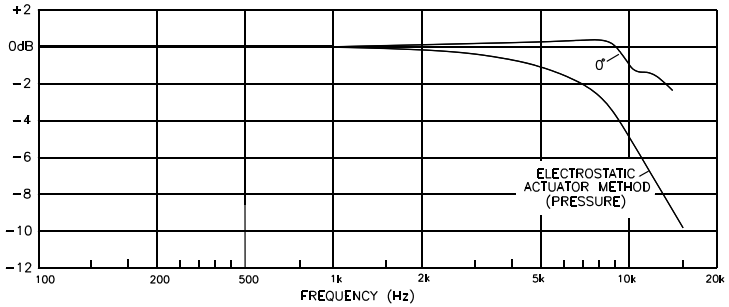


Figure 12. QE7052 Microphone Response

E. Microphone Preamp Extension Cables

The microphone preamp converts the high output impedance of the microphone to a low output impedance, thus allowing the insertion of an extension cable of up to 100 feet in length between the preamp and meter. Quest Technologies offers the following lengths of remote cables:

```
# 59-899  ICM-2    2 Ft. Remote Cable
# 59-733  ICM-10  10 Ft. Remote Cable
# 59-734  ICM-50  50 Ft. Remote Cable.
```

The length of cable between the preamplifier and meter limits the high frequency output capability of the preamplifer. Cable effects are shown in Figure 13.

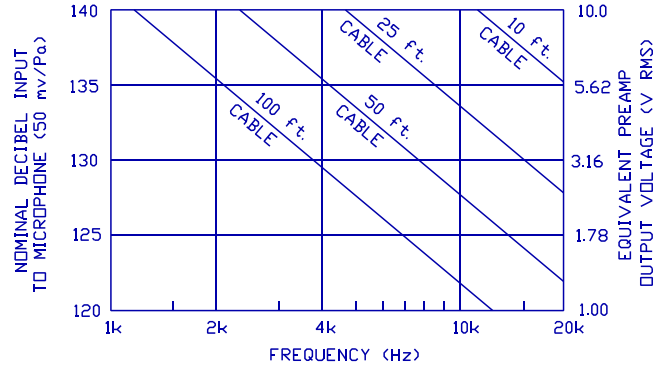


Figure 13. Frequency/Amplitude Limitations with Extension Cables

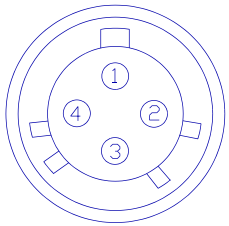
F. Input Buffer Circuitry

The high impedance input circuitry (1 Megohm in series with 0.1 MFD) will accept up to a 10 volt RMS signal. With the microphone and preamp removed, other transducer devices (such as the Quest Model VI-90 Vibration Integrator) can be interfaced to give a dB readout on the meter.

Note that when interfacing other input devices to the Model 1700, the 200 volt microphone polarization switch located inside of the battery compartment should be turned OFF for safety. Only use pins 1 and 3 for the AC signal input. NEVER connect to pins 2 and 4.

To remove the preamp, keep the preamp housing steady while unscrewing the black plastic collar below the preamp housing. Turn in a counter-clockwise direction when viewed from the meter top.

To directly input an AC voltage requires a special connector - Quest part number 14-739. Figure 14 describes the function of each of the pins within the meter input connector.



1 -- SIGNAL INPUT
2 -- +200V
3 -- SIGNAL GND. (SHIELD)
4 -- +17V (DO NOT USE THIS VOLTAGE TO POWER ANY CIRCUITRY OTHER THAN THE QUEST PREAMP.)

Figure 14. Meter Electrical Input (Direct)

G. Weighting Characteristics

The weighting characteristics (frequency response) for A, B, C, and LINear are shown in Figure 15. The "A" weighting response emulates the response of the human ear at low levels and is used for most industrial and community noise measurements. "B" weighting is seldom used. "C" weighting is often used for measuring noise reduction in hearing protectors and for other scientific purposes. The "LINear" weighting has a flat frequency response over the range of human hearing and is useful in many applications such as audiometric analysis. It is also normally used when taking octave band measurements with the optional bandpass filters.

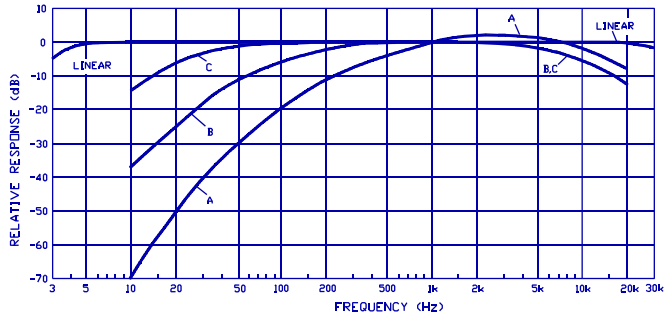


Figure 15. Weighting Characteristics

H. Internal Electrical Noise

The maximum measurable SPL of the 1700 Meter is 140 dB with a sinusoidal input, or 120 dB if measuring a complex signal with a 20 dB crest factor. With optional microphones the upper range can be extended past 150 dB.

When used with either the OB-50, OB-100 or OB-300 filter (octave mode), the specific minimum measurable SPL's when using either the Model QE4170 or the Model QE4146 microphone are as shown in Figure 16. Figure 17 shows the same information for the model 2700. The inherent noise level is typically at least 5 dB below the RMS values shown in each table.

Model QE4170, 1 Inch Microphone:

Octave Band	Weighting Scale			
	A	B	C	LIN
All Pass	23dB	24dB	27dB	35dB
31.5 and 63	<0dB	10dB	20dB	22dB
125 and 250	6dB	12dB	16dB	16dB
500 and 1K	9dB	10dB	10dB	10dB
2K and 4K	11dB	9dB	9dB	10dB
8K and 16K	11dB	9dB	9dB	14dB

Model QE4146, One-Half Inch Microphone:

Octave Band	Weighting Scale			
	A	B	C	LIN
All Pass	27dB	30dB	34dB	40dB
31.5 and 63	5dB	16dB	26dB	29dB
125 and 250	13dB	20dB	23dB	23dB
500 and 1K	17dB	17dB	18dB	18dB
2K and 4K	14dB	13dB	13dB	14dB
8K and 16K	13dB	12dB	12dB	15dB

Figure 16. Minimum measurable SPL's for the Model 1700 using the Model QE4170 and the Model QE4146 microphones.

Model QE7052, One-Half Inch Microphone:

Octave Band	Weighting Scale			
	A	B	C	LIN
All Pass	35dB	37dB	40dB	48dB
31.5 and 63	10dB	25dB	37dB	37dB
125 and 250	21dB	27dB	31dB	31dB
500 and 1K	24dB	25dB	25dB	25dB
2K and 4K	27dB	25dB	25dB	25dB
8K and 16K	29dB	27dB	27dB	30dB

Figure 17. Minimum measurable SPL's for the Model 2700.

I. Tone Burst Response

Figures 18 through 22 are plots for each of the response settings of the meter. They show how the meter responds to a given sinewave input of varied pulse duration.

SLOW RESPONSE (1000 msec time constant) Figure 18.
Decay Rate = 4.35 dB per second

FAST RESPONSE (125 msec time constant) Figure 19.
Decay Rate = 34.7 dB per second

PEAK RESPONSE (50 microsecond time constant) Figure 20.

IMPULSE RESPONSE (35 msec rise time constant with a decay rate of 2.9 dB/sec) Figure 21 and Figure 22.

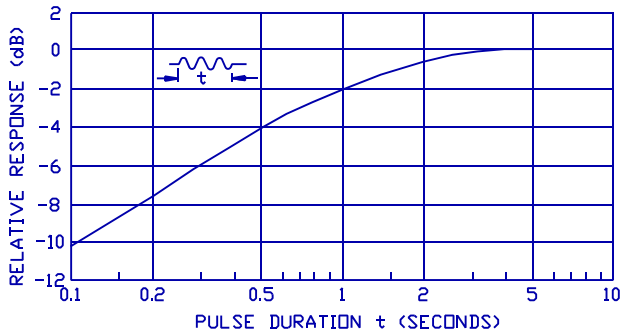
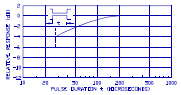


Figure 18. SLOW Response



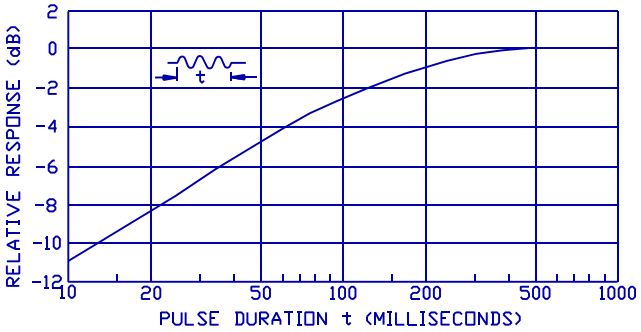
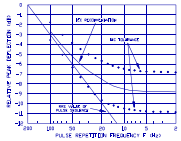


Figure 19. FAST Response

Figure 20.
PEAK Response



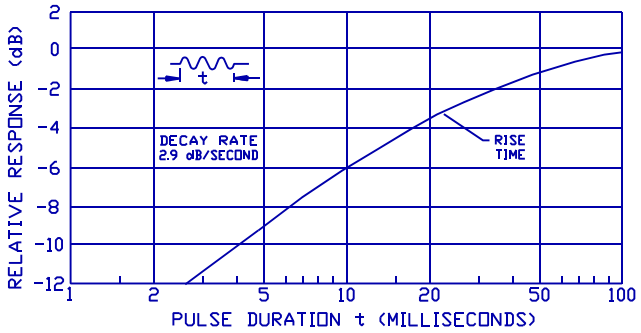


Figure 21. IMPULSE Response

Figure 22.
IMPULSE
Response to
Repeated
Impulses

VI. SPECIFICATIONS

Standards: Model 1700 : Type 1 ; Model 2700 : Type 2
ANSI S1.4-1983, IEC 651-1979.

Display: 3-1/2 Digit Liquid Crystal Display with an additional Quasi-Analog 60 dB indicator in 2 dB increments. Level display indicates to 0.1 dB resolution. Indicators are included for Battery Check, Hold, and Overload Indication.

Modes of Operation: Measures Sound Pressure Level (SPL) and Maximum Level (MAX). Peak Level (PEAK) and Impulse Level (IMP) can also be measured.

Minimum Measurement: Model 1700 Meter only; With Model QE4146 Microphone -- 27 dBA. Model 2700 Meter only - 35dBA. Using Linear Weighting with an Octave Filter Set; See Figures 16 and 17. The minimum measurement varies depending on the filter frequency selected.

Maximum Measurement: With Model QE4146 or QE7052 Microphone -- 120 dB with 20 dB Crest Factor. (140 dB if measuring a sinusoidal signal.) Overload indication will occur if upper range is exceeded. Optional microphones for model 1700 will shift the measurement range upward.

Frequency Weighting Networks: A, B, C, and Linear. When using a filter set, any one of the weightings may be selected.

Meter Response: Slow, Fast, Impulse, and Peak. (The Peak onset time constant is less than 50 microseconds). Peak measurements may be made in either A, B, C, or Linear Weighting.

Microphones: Removable precision 1/2 inch prepolarized condenser (electret) microphone is standard. Optional 1/2 inch, one inch, and other microphones are available for the model 1700 only.

Preamplifier: Directly accepts 0.52" microphone, other sizes with proper adapter. Removable preamp will drive up to 100 feet of cable with negligible signal loss.

Model 1700: Preamplifier model 056-856. The input impedance is greater than 1 Gohm in parallel with 2 pF.

Model 2700: Preamplifier model 056-852. The input impedance is greater than 1 Gohm in parallel with 47 pF.

Polarization (1700 only): Regulated 200 V DC within 2% for use with air-condenser microphones. The voltage must be switched off when using prepolarized (electret) condenser microphones.

Meter Input: The input impedance is 1 Megohm in series with 0.1 MFD. The maximum sinusoidal input voltage is 10V RMS.

AC Output: 3.16 V RMS at full scale (60 dB). (3.8 V RMS maximum) The output impedance is 3.2K ohms. Connected equipment should be at least 10K ohms. The output can be shorted without damaging the meter or changing the meter reading.

DC Output: 0 to 1.00V DC; 60 dB span. Each 0.167V change equals 10 dB. Connected equipment should be at least 10K ohms. The output can be shorted without damaging the meter or changing the meter reading.

Frequency Range: 4 Hz (-3dB) to 50 kHz (-3dB) on linear weighting, meter only. (Subject to microphone limitations.)

Reference Range: 60 to 120 dB Range setting

Reference SPL: 94 dB

Reference Frequency: 1 kHz

Reference Direction: 0^{o} when using a Free Field Microphone. Sound is arriving from directly in front of the microphone diaphragm.

Detector: True RMS

Detector Pulse Range: 63 dB

Detector Measuring Range: From 0 dB to 40 dB on the painted scale (when measuring a signal with a 20 dB Crest Factor). The extra 20 dB (40 to 60) on top of the measuring range produces the 20 dB Crest Factor capability.

Primary Indicator Range / Linearity Range: 60 dB (The range as indicated by both the dB RANGE switch and the painted 60 dB scale.) Tested with a sinusoidal signal input.

Level Linearity: Inside the Primary Indicator Range. It is tested on the Reference Range (60 to 120 dB) with a sinusoidal input signal. Tolerance is +/- 0.7 dB referenced to 94 dB for model 1700, +/- 1.0 dB for model 2700.

Overload Indication: OL appearing in the display indicates overload.

Attenuator Accuracy: Referenced from the Reference Range and the Reference SPL (+34 dB on the painted meter scale).

Model 1700: Within 0.5 dB from 31.5 Hz to 8 kHz. Within 1.0 dB from 20 Hz to 12.5 kHz.

Model 2700: Within 0.7 dB from 31.5 Hz to 8 kHz.

Warm-up Time: 30 seconds.

Accuracy: Model 1700 : Within 0.5 dB at $25^{o}C$; Model 2700 within 0.7 dB at $25^{o}C$. Both models: Within 1.0 dB over the temperature range of $-10^{o}C$ to $+50^{o}C$.

Temperature Range: Operation Temperature Range: $-10^{o}C$ to $+50^{o}C$. Accuracy over the Operation Temperature is within +/- 0.5 dB. Storage Temperature Range (less batteries): $-20^{o}C$ to $+60^{o}C$
Do not exceed the Storage Temperature Range because possible damage to the unit may result.

Operating Humidity: Over a range of 30 to 90% relative humidity, the accuracy is within +/- 0.5 dB. Do not exceed 95% relative humidity because possible damage to the unit may result.

Effect of Magnetic Fields: A magnetic field of 1 Oersted (80A/m) at 60Hz produces a maximum reading of 40 dB on Linear Weighting.

Effect of Electrostatic Fields: Negligible as long as the protection grid is kept on the microphone.

Batteries: Two 9-volt alkaline batteries (NEDA 1604A) will provide approximately 20 hours of continuous operation. (10 hours with optional filter set.)

Tripod Mount: A threaded insert on back of the meter accepts a standard 1/4-20 tripod mounting screw.

Size: 3.3 x 8.2 x 1.8 inches (84 x 208 x 47mm) not including the height of the preamp.

Weight: 24 oz. (680g) including the preamp and batteries.

VII. ACCESSORIES

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
	Calibrator Microphone Adapters
056-990	0.52" diameter
056-988	1/4" diameter
059-344	WS-7 Windscreen for 0.52" microphone (package of 3)
058-115	WS-3 Windscreen for 1" microphone (package of 3)
059-045	TP-1 Tripod (Larger - will not fit inside carrying case
059-046	TP-2 Tripod (Smaller - fits in carrying case)
	Preamplifier Remote Cables
059-899	ICM-2 Microphone Cable (2 foot length)
059-733	ICM-10 Microphone Cable (10 foot length)
059-734	ICM-50 Microphone Cable (50 foot length)
059-703	Input adapter: Female BNC to 0.52" microphone thread, with 18pF capacitance. Allows direct electrical input to the meter.
056-709	DC Power Supply Module: Accepts 12-16VDC input to power the meter and optional filter.

VIII. INTRODUCTION TO THE MODELS OB-50, OB-100 and OB-300.

The Quest Models OB-50 and OB-100 Octave Filters and OB-300 1/3 - 1/1 Octave Filter are plug-in modules containing a bandpass filter with a selectable center frequency. The OB-50 and OB-100 meet the most stringent requirements of ANSI S1.11-1986 and IEC R225-1966 for octave band filters. The OB-100 is a full octave bandwidth active filter with ten selectable center frequencies from 31.5 Hz to 16 kHz, while the OB-50 has nine bands from 31.5Hz to 8kHz. The OB-300 meets the most stringent requirements of ANSI S1.11-1986 and IEC R225-1966 for octave and third octave band filters. The OB-300 is an active filter with 33 selectable center frequencies from 12.5 Hz to 20 kHz when in the 1/3 mode and 11 selectable center frequencies from 16 Hz to 16 kHz when in the 1/1 mode. The filters may be operated manually, or the OB-100 and OB-300 can automatically step through each consecutive band at a user selectable rate.

Primary uses include frequency analysis for product noise emission, material acoustics, community noise, audiometer calibration and analysis of audiometric rooms.

IX. ABOUT THE FILTERS

A. Filter Controls

POWER Switch:

ON/OFF (OB-50 only) -- Turns power on or off to the filter only.

OFF -- Disconnects the filter circuitry from the attached sound level meter. With this switch in the off position, the filter does not use power from the meter batteries.

MANUAL -- Filter frequency selection is performed with two push buttons (START Buttons - ª and «).

AUTO -- Unit automatically cycles through the desired filter frequencies while storing sample information for each frequency during the RUN mode. (Not on OB-50)

START (UP and DOWN Arrows)

Allows the user to step through the different bandpass filters. The two buttons allow manual frequency control (in MANUAL Mode) or frequency direction control (in AUTO Mode). (Manual mode only on OB-50)

-20 dB

When this button is pressed, the output of the filter is amplified by 20 dB and then fed back to the sound level meter. Therefore, 20 dB has to be subtracted from the meter reading when using this button.

TIME (Not on OB-50)

A screwdriver adjustment controls the automatic cycle time of each filter frequency from approximately 5 to 30 seconds.

MODE Switch (OB-300 only)

Selects either the 1/3 octave filter set (33 frequencies) or the 1/1 octave filter set (11 frequencies).

B. Filter Connector

The 30 pin connector on the top of the filter is used for connecting the filter to the sound level meter. Figure 23 shows the pinout for the filter connector.

X. OPERATING PROCEDURE

The Model 1700 becomes an Octave Band Analyzer with the addition of the OB-50 or OB-100 Octave Filter Set or a 1/3 Octave Band analyzer with the addition of the OB-300 Filter Set. The two units are connected together with the long captive screw provided with the filter. The operating considerations for the Model 1700 are basically the same when using the filters with the meter.

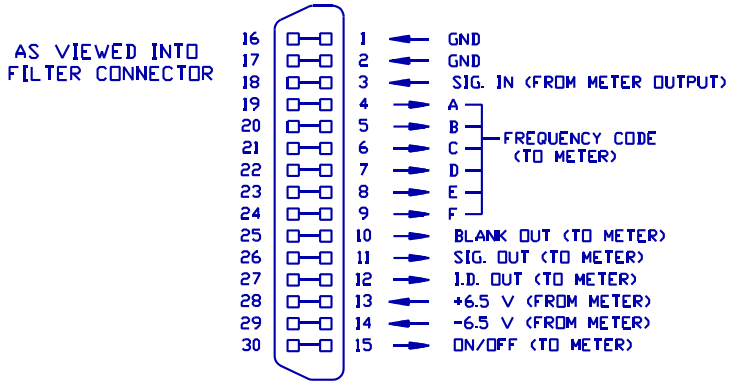


Figure 23. External Filter Connector

A. Operational Check

The Model 1700 should be calibrated as outlined in the meter section of the manual while the filter module is OFF. The filter has a fixed gain of approximately 1 (0 dB) at each center frequency and requires no adjustment. After the meter is calibrated, check the filter for proper operation as follows:

1. Read the calibrator 1 kHz output level. Set the meter dB RANGE switch so that the calibrator level will indicate within the upper 20 dB of the meter display. Set the RESPONSE switch to FAST, WEIGHTING switch to LIN and MODE switch to SPL. Turn the POWER switch to ON.

2. Set the filter's switch to ON or MANUAL. If using an OB-300 set the MODE switch to 1/1. Then use the UP or DOWN arrow buttons on the filter to select the 1 kHz filter.

3. Place the calibrator (and adapter if needed) onto the microphone. Turn the calibrator ON. A meter reading that is very close to the level listed on the calibrator should result. An error of +/- 0.5 dB is acceptable. This is due to the center frequency filter tolerance of +/- 0.5 dB maximum.

4. Change the filter frequency to 500 and read the display. Then change to 2k and read the display. At both frequencies the readings should be 19 to 23 dB less than the 1 kHz calibrator level.

5. Change the filter frequency to 1k and the meter dB RANGE so that the meter reads 20 to 40 dB less than full scale. Press and hold the -20 dB button on the OB-100. The meter reading shall rise approximately 20 dB to verify that the -20 dB button functions.

6. Remove the calibrator. The analyzer is now ready to use.

B. Taking a Measurement

1. Turn the meter POWER switch ON.

2. Set the RANGE to 80 - 140 dB. Set the RESPONSE to FAST, WEIGHTING to LIN (see note below), and the MODE switch to SPL.

NOTE: The filter response can be in series with either A, B, C, or LIN. However, LIN is generally used when taking octave band measurements.

To minimize settling time following a filter band change, FAST response is generally recommended, especially if frequent filter band changes will be made.

3. Turn the filter's POWER switch to ON or MANUAL to activate the filter.

4. Select the desired filter band by pressing the UP or DOWN arrow buttons. Select the RANGE so that the display reads approximately 20dB below the top of the range.

AUTO Filter Operation (OB-100 and OB-300)

Set the meter for FAST response time to minimize its settling time after the filter switches frequencies. Select the first frequency of interest. (Be sure that the TIME adjustment is set to the desired filter cycle time.)

Slide the filter POWER switch to AUTO. To start the sampling sequence and press the proper direction button. (The ª button causes the frequency to cycle to the next higher frequency, the « button causes the frequency to cycle to the next lower frequency.) Allow a brief period of time after the frequency changes to allow for measurement settling time.

XI. TECHNICAL INFORMATION - OB-50 and OB-100

The OB-50 and OB-100 conform to ANSI S1.11-1986, Order 3, Type 2, Sub-type C and IEC R225-1966. The normalized passband characteristic of a typical octave filter response is depicted in Figure 24.

The OB-50 and OB-100 filter is flat within 0.5 dB in the passband, with the 3 dB down points at approximately .707 fc and 1.414 fc where fc is the center frequency of the band chosen. The fc/2 and 2fc frequencies are down by approximately 21 dB with the decade points (fc/10 and 10fc) down by greater than 70 dB.

The block diagram of the filter is shown in Figure 26.

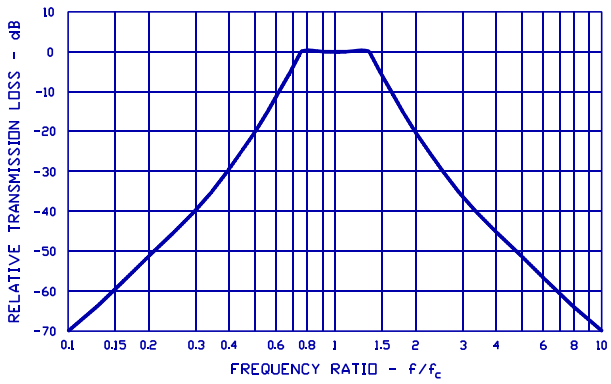


Figure 24. Typical OB-50/OB-100 Filter Response

XII. SPECIFICATIONS - OB-50 and OB-100

Standards: ANSI S1.11-1986, Order 3, Type 2, Sub-type C and IEC R225-1966.

Center Frequencies:

OB-50 : 9 frequencies from 31.5 Hz to 8 kHz.
OB-100: 10 frequencies from 31.5 Hz to 16 kHz.

Frequency Selection: Full manual control (both models) or automatic sequential stepping through each frequency (OB-100).

Power Source: Sound Level Meter.

Size: 3.3 x 2.8 x 1.8 inches (84 x 71 x 47mm)

Weight: 6 ounces (170 grams)

XIII. TECHNICAL INFORMATION - OB-300

The OB-300 conforms to ANSI S1.11-1986, Order 3, Type 2, Sub-type C and IEC R225-1966. The normalized passband characteristics of both the 1/1 and 1/3 filter responses are depicted in Figure 25.

The 1/1 filters are flat within 0.5 dB in the passband, with the 3 dB down points at approximately 0.707 fc and 1.414 fc where fc is the center frequency of the band chosen. The fc/2 and 2fc frequencies are down by approximately 21 dB with the decade points (fc/10 and 10fc) down by greater than 70 dB.

The 1/3 filters are flat within 0.3 dB in the passband, with the 3 dB down points at approximately 0.89 fc and 1.12 fc where fc is the center frequency of the band chosen. The fc/2 and 2fc frequencies are down by approximately 50 dB.

The block diagram of the OB-300 is shown in Figure 26.

XIV. SPECIFICATIONS - OB-300

Standards: ANSI S1.11-1986, Order 3, Type 2, Sub-type C and IEC R225-1966.

Center Frequencies: (1/3 Mode) 33 frequencies from 12.5 Hz to 20 kHz. (1/1 Mode) 11 frequencies from 16 Hz to 16 kHz.

Frequency Selection: Full manual control or automatic sequential stepping through each frequency.

Power Source: Sound Level Meter.

Size: 3.3 x 4.2 x 1.8 inches (84 x 107 x 47mm)

Weight: 9 ounces (255 grams)

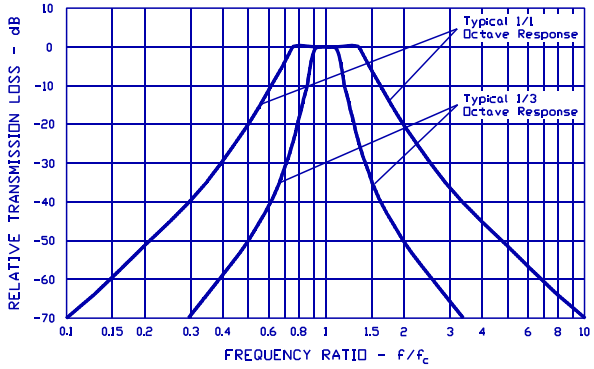


Figure 25. Typical OB-300 Filter Response

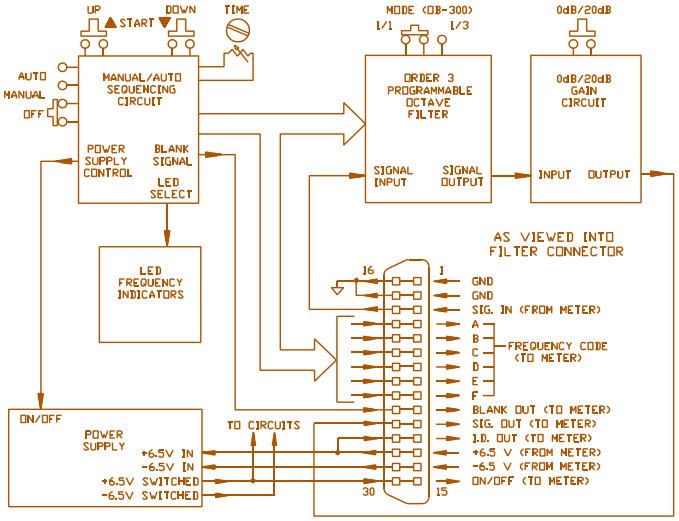


Figure 26. Block Diagram of Models OB-50, OB-100 and OB-300

XV. QUEST SERVICE AND WARRANTY POLICY

A. Service Policy

The Quest product you have purchased is one of the finest 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 (414)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, 510 S. Worthington St., 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, (414) 567-9157 or (800) 245-0779. Office hours are from 8 AM to 5 PM (Central Standard Time) Monday through Friday.

B. Warranty Policy

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 subject 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 authorized sales agent for details.