INSTRUCTION MANUAL

FOR

MODEL 372
SOUND LEVEL
CALIBRATOR

TRIPLETT

BLUFFTON, OHIO 45817

MODEL 372
SOUND LEVEL
CALIBRATOR

TRIPLETT MODEL 372

SOUND LEVEL CALIBRATOR

LIST OF ILLUSTRATIONS

TRIPLETT 372
SOUND-LEVEL CALIBRATOR
SPECIFICATIONS

ACOUSTIC OUTPUT

FREQUENCIES:	125, 250, 500, 1000 and 2000Hz, ±3%
SOUND-PRESSURE LEVEL:	Selectable 100 db or 144 db, RE: .0002 dyne/cm²

ACCURACY AT 23°C and 760mm hg:

	at 500 Hz	Other Frequencies
Columbia SPM-100 or Equivalent	±0.3 db.	±0.5 db
Other Microphone	±0.5 db.	±0.7 db

TEMPERATURE COEFFICIENT:	-.01 db/F°
PRESSURE CORRECTION:	Chart Supplied

ELECTRICAL OUTPUT

VOLTAGE:	1 volt rms, ± 10% into 100 K ohm load
OUTPUT IMPEDANCE:	< 20 ohms
FREQUENCY RESPONSE:	± 2%
DISTORTION:	< 1%
CONNECTOR:	Miniature Phone Jack

GENERAL

OPERATING ENVIRONMENT:	25° F to 125° F, 0 to 100% relative humidity
BATTERY:	NEDA 1611 or 1600
DIMENSIONS:	2¼" dia. x 6" L
WEIGHT:	1 lb.

TRIPLETT MODEL 372

SOUND-LEVEL CALIBRATOR

1.0 GENERAL DESCRIPTION

The Model 372 Sound Level Calibrator is a portable and accurate self-contained device for checking the calibration of sound measuring instruments. The Model 372 can be used for the field calibration of TRIPLETT Models 370 Sound Level Meter, 380 Sound Level Integrator, and 376 Personal Noise Dosimeter.

The Model 372 may also be used to calibrate any 5/8 inch or 15/16 inch diameter microphone. The 372 generates five USASI preferred frequencies: 125, 250, 500, 1000 and 2000 Hz.

1.1 Controls

1.1.1 Frequency Selector

A six-position rotary switch located on the rear panel applies power to the oscillator circuit and selects the frequency of the signal generated.

1.1.2 Level Selector/Bat. Test

A three-position toggle switch located on the rear panel selects either 100 db or 114 db calibration level and activates the battery test circuit.

1.2 Outputs

1.2.1 Electrical Output

A miniature phone jack supplies a 1 volt AC output of the same frequency applied to the microphone under test.

1.2.2 Acoustic Output

The acoustic output from the calibrator is obtained at the end of the instrument opposite from the controls. The correct acoustic output is obtained when a 15/16 inch microphone or smaller diameter microphone in a 15/16 inch adaptor is properly seated in the 15/16 inch recess at the bottom of the calibrator.

2.0 THEORY OF OPERATION

The Model 372 consists of an oscillator, which generates a sinusoidal signal. This signal drives an acoustic transducer that supplies a high-level acoustic calibrating signal to a coupler which fits over the microphone under test.

2.1 Oscillator

The oscillator is a battery operated Wien-Bridge oscillator. An integrated circuit operational amplifier supplies the voltage gain necessary to sustain oscillations and also the power gain to drive the acoustic transducer. A field effect transistor is employed as a variable resistor in the feedback circuit to stabilize the oscillator and reduce distortion.

2.2 Acoustic Output

The oscillator drives a small controlled-reluctance magnetic loudspeaker. The loudspeaker drives one end of an acoustic coupler. The microphone to be calibrated is used to close the coupler.

3.0 OPERATING PROCEDURE

3.1 Battery Check

To check the battery of the Model 372, the three-position toggle should be pressed to the "Bat. Test" position. From this position the switch should

self-return to the 100 db position when it is released. The light emitting diode should glow a bright red when this switch is in the "Bat. Test" position. If the diode does not glow or is barely visible, the battery should be replaced.

3.2 Operating Check

The Model 372 is turned on by rotating the frequency selector control counter clockwise to the 2000 Hz position. A clear 2000 Hz tone should be heard when the knob is in this position. The 1000, 500, and 250 and 125 Hz frequencies will sound to the ear as if they are progressively lower in level than the 2000 Hz tone; this is normal and should not be cause for alarm.

3.3 Calibration of Sound-Measuring Instruments

The Model 372 Sound-level Calibrator is adjusted to develop a constant sound-pressure level of 114 db or 1000 db, re. .0002 microbar at each of five frequencies (125, 250, 500, 1000 and 2000 Hz), when its acoustic coupler is placed over a high (acoustic) impedance sound-measuring microphone.

These levels are established by adjusting the calibrator output to register 100 db or 114 db sound pressure level on a sound-measuring system using a carefully maintained laboratory standard microphone. Normal variation of temperature and atmospheric pressure will have negligible effect on the sound-pressure level developed.

The specifications give the value of the temperature coefficient, and the curves in Fig. 1 show the variations of sound-pressure level with atmospheric pressure.

As long as the volume enclosed by the coupler is kept constant, including the effective volume of the microphone to be calibrated, the sound-pressure level developed in the calibrator coupler is constant.

3.4 Calibration of Sound-Level Meters

Sound-level meter microphones manufactured in the United States are usually adjusted to have nominally flat response to sounds of random incidence in a free-field.

The response of the amplifier in the sound level meter is modified to obtain the required weighting characteristics. To determine what a sound-level meter should read when a Model 372 is coupled to its micròphone, one must correct for the difference between the microphone random-incidence free-field response and its pressure response, and for the difference between a flat-amplifier response and the weighted amplifier response. Corrections of perpendicular-incidence to the pressure response of Columbia Research Laboratories' microphones are given in Table 1.

Frequency Hz	db to be added to pressure Response to Yield Perpendicular Incidence Response
1000 Hz	0
2000 Hz	-0.3

Table 1 Pressure Response Corrections for Columbia Research Laboratories' Microphones

The USASI weighting characteristics for sound-level meters from the USA Standard specifications for general-purpose sound-level meters, S1.4-1971 are listed in Table 2 for the five calibrator frequencies.

Deviations in db from Flat Response For Sound-Level Meter Weighting					
Weighting	Frequency (Hz)				
	125	250	500	1000	2000
C	- 0.2	0	0	0	-0.2
B	- 4.3	-1.4	-0.3	0	-0.2
A	-16.2	-8.6	-3.3	0	+1.2

Table 2

3.4.1 Calibration of Model 370 Sound-Level Meter

To calibrate the Model 370 Sound Level Meter place the Calibrator over the microphone of the sound-level meter to be calibrated. See Table 2 for design-center deviations from applied db level resulting from sound-level meter weighting networks.

The values of Table 2 should be algebraically added to the calibration level applied to yield the true meter indication.

3.4.2 Calibration of the Model 380 Sound-Level Integrator

To calibrate the Model 380 Sound-Level Integrator place the calibrator over the microphone. Apply the calibration signal to the microphone for exactly 1 minute and note the number of counts accumulated during that interval. See Table 3 for the number of counts which should be accumulated during a 1 minute exposure of the applied db level and frequency.

Calibration Level	Frequency (Hz)				
	125	250	500	1000	2000
114 db	4-7	15-22	33-44	56-63	53-75

Table 3. Deviation from Flat Response for Sound-Level Meter Weighting.

3.4.3 Calibration of the Model 376 Personal Noise Dosimeter

Refer to Paragraph 2.4.2 Calibration of the Model 379 Sound-Level Integrator.

3.4.4 Pressure and Altitude Corrections

The Model 372 is subject to altitude and atmospheric pressure changes in relation to its acoustical output. The graph in Fig. 1 shows the change in sound-pressure level with a change in altitude and atmospheric pressure. Each frequency has its own curve to be used when determining the output level at a specific altitude or pressure. The pressures given by the United States Weather Bureau are corrected pressures (pressures referred to sea level). The actual barometric pressure can be requested of your local weather station or you can correct the published barometric reading for your own location. The correction is primarily a function of altitude. This correction is one inch of mercury per 1000 feet above sea level.

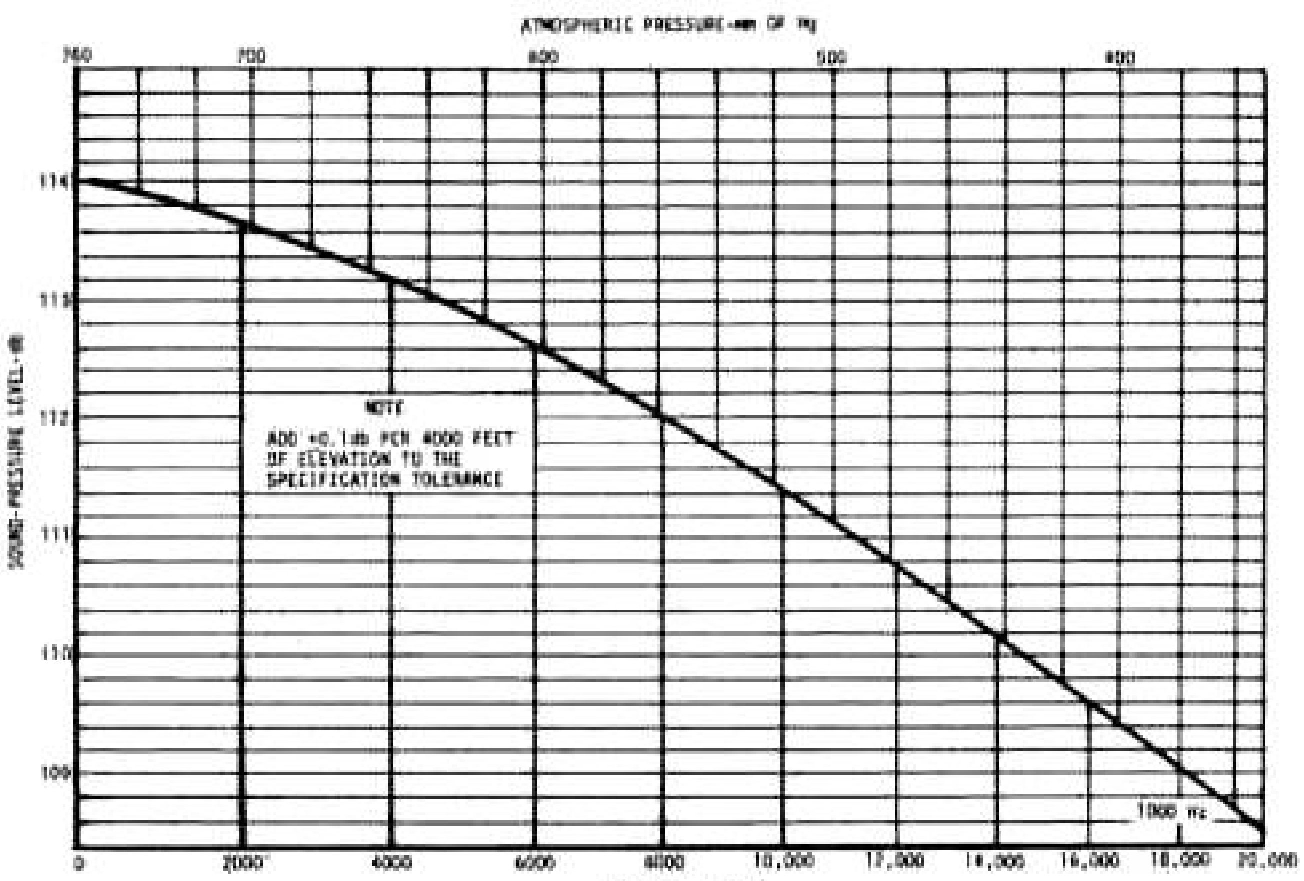

Fig. 1 Variation of Sound-Pressure Level in Relation to Changes in Atmospheric Pressure and Altitude.

When the curves of Fig. 1 are used to determine the acoustical output of the calibrator at high altitude, an additional tolerance of ±.1 db per 4000 feet of elevation must be added to the existing specification tolerance.

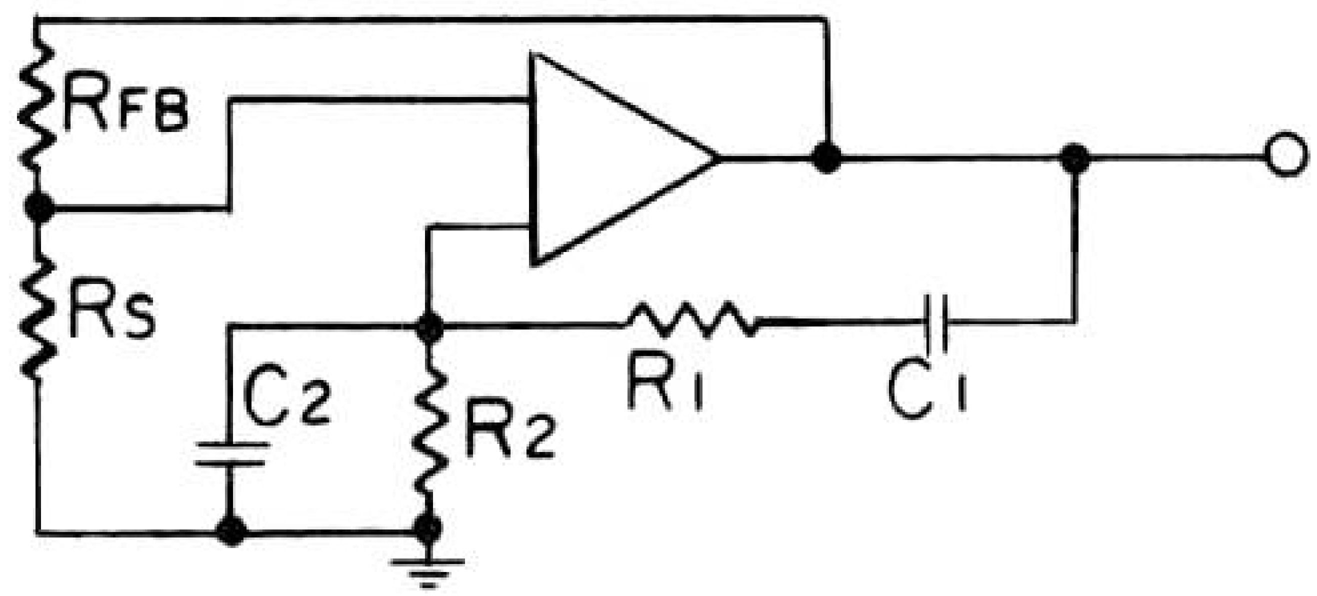

Fig. 2 Functional Diagram of Oscillator of the 372

4.0 PRINCIPLES OF OPERATION

4.1 The Wien-Bridge Oscillator

A functional diagram of the oscillator employed in the Model 372 is shown in Fig. 2.

The networks R_1, C_1 and R_2C_2 determine the frequency at which the oscillator will operate. This network forms a voltage divider, the transfer function of which is equal to 1/3 at the frequency of oscillation.

The loop gain must be +1 for stable operation, therefore, the amplifier gain should be set at +3. The amplifier gain from the noninverting (+) input to the output is determined by the expression:

$$\frac{R_{FB}}{R_S} + 1$$

In the Model 372, is a network employing a field effect transistor as a voltage sensitive resistor. The control voltage applied to the FET is proportional to the output of the oscillator, thus forming a negative feedback loop which stabilizes the output of the oscillator.

4.2 Output Amplifier

The Model 372 contains an output amplifier the gain of which may be switched from 0 to -14 db. The acoustical output is 114 db when the output amplifier is operated at a gain of 0 db and 100 db when it is switched to the -14 db gain.

4.3 Electrical Output

The oscillator output voltage is fed to a miniature phone jack which makes available a sine wave of 1 V RMS ± 20%.

4.4 Battery Check Circuit

The battery check circuit consists of a series circuit made up of a zener diode, a resistor and a light emitting diode. The function of the circuit is to test the battery under a loaded condition. The zener diode establishes the minimum acceptable operating voltage. If the battery voltage is below this value no current will flow and the LED will remain dark, if current flows in the circuit the LED will glow indicating the battery is usable.

5.0 SERVICE AND MAINTENANCE

5.1 Battery Replacement

To replace the battery the cylindrical cover must first be removed. This is done by removing the knurled screw located on the polished ring nearest the acoustical output cavity of the calibrator, and sliding the cover back over the rear panel. The

battery is replaced by removing the wire terminal clip and pushing the old battery out of the clip hard mounted to the chassis. Install the new battery (NEDA #1600) and check before reinstalling the cover.

5.2 Calibration

The calibration of the Model 372 requires equipment not normally found in standard electronic calibration laboratories. It is recommended that the unit be returned to the factory for calibration.

A
R11
10K
D
RV1
1K
R16
1K
B
2
-
8
N5558T
IC1A
C
+
3
4
1
R12
12K
C7
+ -
60μf,6V
C5
+ -
2.2μf,20V
CR1
1N914
R17
20K
C4
+ -
10μf,20V
GRD
R18
150K
+ C6
150μf
6V
5
+
N5558T
IC1B
-
6
7
R13
750Ω
R14
1.5K
ITE4868
Q1
D
S
G
R20
23.2K
CR3
1N754
R19
47Ω
L
CR2
MV508/17
R21
23.2K
N
GRD
R15
82.5K,1%
SW1
SW2₁
R1
1.15K
R2
2.32K
R3
4.64K
R4
9.31K
R5
18.7K
C1
.068μf
C2
.068μf
SW2₂
R6
1.15K
R7
2.32K
R8
4.64K
R9
9.31K
R10
18.7K
C8
+ -
60μf,6V
SW2₃
SW2₄
.22μf
+ -
C3
RV2
1K
F
G
RV3
1K
H
RV4
1K
J
RV5
1K
K
RV6
1K
M
E
C9
- +
1μf,35V
J1
B1
9V
T1

PARTS LIST

MODEL 372

REF. NO.	DESCRIPTION
Resistors	
R1	Metal Film, 1.15 K ohm, 1/6 w, 1%
R2	Metal Film, 2.32 K ohm, 1/6 w, 1%
R3	Metal Film, 4.64 K ohm, 1/6 w, 1%
R4	Metal Film, 9.31 K ohm, 1/6 w, 1%
R5	Metal Film, 18.7 K ohm, 1/6 w, 1%
R6	Metal Film, 1.15 K ohm, 1/6 w, 1%
R7	Metal Film, 2.32 K ohm, 1/6 w, 1%
R8	Metal Film, 4.64 K ohm, 1/6 w, 1%
R9	Metal Film, 9.31 K ohm, 1/6 w, 1%
R10	Metal Film, 18.7 K ohm, 1/6 w, 1%
R11	Composition, 10 K ohm, 1/4 w
R12	Composition, 12 K ohm, 1/4 w
R13	Composition, 750 ohm, 1/4 w
R14	Composition, 1.5 K ohm, 1/4 w
R15	Metal Film, 82.5 K ohm, 1/6 w, 1%
R16	Composition, 1K ohm, 1/4 w
R17	Composition, 20 K ohm, 1/4 w
R18	Composition, 150 K ohm, 1/4 w
R19	Composition, 47 K ohm, 1/4 w
R20	Metal Film, 23.2 K ohm, 1/6 w, 1%
R21	Metal Film, 23.2 K ohm, 1/6 w, 1%
RV1	Potentiometer, 1 K ohm
RV2	Potentiometer, 1 K ohm
RV3	Potentiometer, 1 K ohm
RV4	Potentiometer, 1 K ohm
RV5	Potentiometer, 1 K ohm
RV6	Potentiometer, 1 K ohm
Capacitors	
C1	Polycarbon, .068 mf, 100 volt, ±2%
C2	Polycarbon, .068 mf, 100 volt, ±2%
C3	Tantalum, .22 mf, 35 volt
C4	Tantalum, 10 mf, 20 volt

C5	Tantalum, 2.2 mf, 20 volt
C6	Tantalum, 150 mf, 6 volt
C7	Tantalum, 60 mf, 6 volt
C8	Tantalum, 60 mf, 6 volt
C9	Tantalum, 1 mf, 35 volt

Semiconductors

IC1	N5558T Integrated circuit
CR1	Silicon Diode 1N914
CR2	Light emitting diode MV-50
CR3	Zener diode 1N754
Q1	Field effect transistor ITE 4868

Misc.

SW1	Switch DPDT On, Off, momentary
SW2	4 pole, 6 position rotary switch
B1	Battery NEDA 1611 or 1600
T1	Controlled magnetic transducer
J1	Phone jack, miniature

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be tested as soon as it is received. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent, and this report should be forwarded to us. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. Include model number and serial number when referring to this instrument for any reason.

WARRANTY

The Triplett Corporation warrants instruments manufactured by it to be free from defective material or factory workmanship and agrees to repair or replace such instruments which under normal use and service, disclose the defect to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing or replacing any instrument or test equipment which proves to be defective, when returned to us transportation prepaid, within ninety (90) days from the date of original purchase.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons or service stations in any way so as, in our judgment to injure their stability or reliability or which have been subject to misuse, negligence or accident or which have had the serial number altered, effaced, or removed. Neither does this warranty apply to any of our products, which have been connected, installed, or adjusted otherwise than in accordance with the instructions furnished by us. Accessories including transistors, fuses, cables and batteries not of our manufacture used with this product are not covered by this warranty.

The Triplett Corporation reserves the right to discontinue models at any time, or change specifications, price or design, without notice and without incurring any obligation.

Upon acceptance of this material the purchaser agrees to assume all liability for any damages, and bodily injury which may result from the use or misuse of the material by the purchaser, his employees, or others and that the Triplett Corporation shall incur no liability for direct or consequential damage of any kind.

This warranty and conditions of sale are in lieu of all others expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

IF ANY FAULT DEVELOPS, THE FOLLOWING STEPS SHOULD BE TAKEN:

1. Notify us, giving full details of the difficulty, and include the model number and serial number. On receipt of this information, we will give you service data or shipping instructions.
2. On receipt of shipping instructions, forward the instrument prepaid, to the factory. If requested, an estimate of the charges will be made before the work begins provided the instrument is not covered by the warranty.

TRIPLETT CORPORATION
Bluffton, Ohio
45817