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1071-8051-110



# **Safeguards and Precautions**



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

## LIMITED WARRANTY

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

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

## **DECLARATION OF CONFORMITY**

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## Monarch Instrument

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

declares that the product:

Name: Model: Sound Level Meter Monarch 321

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

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

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

14<sup>th</sup> March 2000

Importer (Amherst, NH)

Alan Woolfson, VP Engineering (Authorized Signature)

### **1.0** Introduction:

This instrument is a Type 2 Sound Level Meter intended for general-purpose measurements of sound pressure levels in industrial and environmental applications. It is equipped with A and C frequency weighting and Fast and Slow time weighting. It complies with IEC651 Type 2 and ANSI S1.4 Type 2 standards. It is provided with both an ac output of 0-1 Vrms over the full scale of the range selected and a dc output of 10 mV/dB, plus a RS232 interface for bidirectional communication with a PC.

## 2.0 Specifications:

Standard Compliance:		IEC651 Type 2, A	ANSI S1.4 Type 2	
Measurement range:		30 - 130dB		
Dynamic range:		50 dB		
Scale Ranges	: Low:	30 - 80dB		
	Medium:	50 - 100 dB		
	Hiah:	80 - 130 dB		
	Auto:	30 - 130 dB		
Frequency rai	nae:	31.5Hz - 8KHz		
Frequency we	ighting:	A, C		
Time weighting:		Fast (125 mS), S	low (1 sec.)	
Microphone:		1/2 inch electret	condenser microphone	
Digital display:		4 digits	·	
Resolution		0.1dB		
Update Rate:		0.5 sec.		
Analog display:		50 segment barg	raph	
Resolution:		1dB		
U	pdate Rate:	50mS		
Accuracy:		±1.5dB (under re	ference conditions, 94dB @ 1KHz)	
Out of Range Indication:		Displays 'OVER' when overrange for bargraph scale selected		
-		<b>Displays 'UNDEF</b>	R' when underrange for bargraph scale selected	
		Displays '-LO' when underrange is by least 20 dB		
MAX/MIN hold:		Maximum and Minimum RMS value hold		
Digital output:		Bi-directional RS232		
AC output:		0 – 1 Vrms over scale range selected		
		Approx.100Ω output impedance		
DC output:		10 mV/dB		
		Approx.1KΩ output impedance		
Power require	ement:	9 Volt battery, NEDA 1604 or JIS 006P or IEC 6F22		
Battery life:		Approx. 50 hours	with alkaline battery. Low battery indication.	
<b>Operating Co</b>	nditions:			
<ul> <li>Operating Temperature</li> </ul>		e and Humidity:	0°C - 40°C (32°F - 104°F); 10 - 90% RH	
			Non-condensing	
<ul> <li>Storage Temperature</li> </ul>		and Humidity:	-10°C - 60°C (14°F - 140°F); 10 - 75% RH	
Ū	•	•	Non-condensing	
<ul> <li>Altitude up to 2000 me</li> </ul>		eters (6500 feet)	J. J	
Dimensions: 275×64×30		nm (10.8×2.5×1.2	in)	
Weight: Approx 2850		a (10.0 oz)	,	
Accessories: Windscreen		. Battery. Carrvin	a Case, 3.5 mm Plug, Screwdriver, Instruction	
	Manual	,,,,	5 ····, · · ···;, · ···;, · ···;, · ···;, · ···	
Options: AC Adaptor: 9VDC (8-15VDC Max.) @ 3		9VDC (8-15VDC	Max.) @ 30mA, 3.5mm (+), 1.35mm (-)	
•	Software an	d RS232 cable		

### 6.0 **Operating Instructions:**

#### 6.1 Preparation for Measurements

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

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

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

Turn the instrument on and adjust the frequency weighting, time weighting and scale level in accordance with the provisions of Sections 4.2, 4.3 and 4.4 respectively. Disable MAX / MIN (Section 4.5) until proper operating conditions have been established.

#### 6.2 Instrument Placement

Proper placement of the instrument is critical to accurate measurements.

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

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

#### 6.3 Taking Readings

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

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

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

#### 6.4 Preparation for Storage

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

UNDER	: Value is underrange for bargraph scale selected				
MAX	: The Maximum value is now being displayed				
MIN	: The Minimum value is now being displayed				
FAST	: Fast time weighting mode (125mS)				
SLOW	: Slow time weighting mode (1 Sec.)				
OVER	: Value is overrange for bargraph scale selected				
88 - 180	: Analog (bargraph) scale range				
AUTO	: Indicates 'Auto Level Range' selected				
Ø	: Indicates 'Auto Power Off' is enabled				
dBA	: A frequency weighting mode				
- +	: Low battery indication. Battery voltage is not sufficient for proper operation.				
-LO	: Indicates value is underrange by at least 20 dB				

dBC : C frequency weighting mode

> 800 (13)  $\odot$ (3)  $(\mathbf{O})$ (10) (4)C€ FAS 9V N ED'A 1564 (5)PLEAS Med 5 100 Hi 8 130 Aut 3 130 IEC 651 TYPE ր b<sup>l</sup>w er.up (Ը) ծ (Ο) նածծ ///Օ ՏԻ

#### Feature Locations:

- 1) Windscreen
- 2) LCD display
- 3) ON/OFF button
- 4) MAX MIN button
- Scale Range Up and Down 5)
- 6) Frequency weighting button
- 7) Time weighting button

- 9) Offset calibration screw
- 10) Digital output connector (RS232)
- 11) AC and DC output signals connector
- 12) AC Power Adaptor connector
- 13) Tripod connector
- 14) Battery compartment cover



#### 4.0 Control Functions:

#### 4.1 Power and Backlight

The **O** button turns both the instrument power and the display backlight ON or OFF. Press it once to turn the power ON. Every subsequent momentary press toggles the backlight ON or OFF. Press and hold this button for 3 seconds to turn the power OFF.

#### 4.2 Frequency Weighting Selection

The frequency weighting selected is determined by the measurement application.

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

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

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

#### 4.3 Time Weighting Selection

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

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

#### 4.4 Level Selection

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

#### 4.5 MAX / MIN Function

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

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

#### 4.6 Auto Power Off

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

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

#### 4.7 Low Battery Condition

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

#### 4.8 Digital Output

The RS232 Digital Output is a 9600 bps N 81 serial interface. TX RX is a 5V normally high input port.



#### 4.9 AC and DC Output Signals

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

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

Ground 0.000 **T** 

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

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

#### 5.0 Calibration Procedure:

#### 5.1 Calibration requirements

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

#### 5.2 Calibration Settings

Turn the instrument on and select the following settings:Frequency weighting:ATime weighting:FastLevel range:50 – 100 dBMAX / MIN Mode:Disabled

#### 5.3 Installing Acoustic Calibrator

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

#### 5.4 Adjusting Calibration

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



#### 5.5 Re-calibration

The sound level meter is supplied factory calibrated.

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