

THE

Larson-Davis OUTDOOR NOISE MONITORING SYSTEM

A-95-01
T-A-800



Larson-Davis offers a complete Outdoor Noise Monitoring System which includes (A) the Model 2100 Preamplifier, (B) the Model 870 Sound Level Meter, and (C) the Model 2150 Tilt-down Tower. Optional enhancements available include (D) the Model 2140 Wind Speed and Direction Monitor, (E) the Model 2142 Temperature and Humidity Sensor, and (F) a solar panel and (G) a wireless modem link which allow installation in areas not served by power/telephone utilities. All components are manufactured with materials that provide maximum resistance to shock, corrosion, and extremes in environmental conditions.

(A) Preamplifier

An aerodynamically designed profile minimizes wind resistance and acoustic reflections. Included accessories are:

- Electrostatic actuator which gives a steady tone to verify that the system is correctly calibrated
- Heater and drying agent to keep the microphone at a steady temperature and free of moisture
- Windscreen
- Birdspikes
- Rainhat

(B) Sound Level Meter

Having the capacity to measure and store up to 250,000 samples of data on noise, vibration, wind, temperature, and humidity makes the 870 the most versatile and powerful airport and environmental data monitor available.

Some of its other key features are:

- 115 dB dynamic range
- Noise floor less than 20 dBA
- A, C, and linear weightings
- 16 individual bandwidths
- 3 parallel detectors: weighted and unweighted peak and rms
- Automatic calibration check
- 9 month memory retention
- Lithium battery backup

(C) Tilt-down Tower

The tilt-down design makes accessing and maintaining all components easy. All cables are installed inside the tower core for protection against adverse weather conditions and vandalism.

(D) Wind Speed/Direction

The collection of wind data is useful for qualifying noise measurements.

The 2140's high quality components assure excellent fidelity, low threshold, and fast response in measuring:

- Average wind speed
- Speed, time, and direction of maximum gust
- Percentage and number of times above threshold
- Percentage of windy time from each of eight compass points

(E) Temperature/Humidity

The 2142 sensors permit the system to monitor the current, average, extremes, and number of exceedances above threshold for temperature and humidity.



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LARSON • DAVIS Weather Sensor System



Collecting meteorological data is necessary in many environmental and airport noise monitoring situations. The powerful Model 870 Environmental Noise Monitor is designed to meet that need, offering inputs for receiving measurements from the Model 2140 Wind Speed and Direction Monitor and the Model 2142 Humidity and Temperature Sensor. In combination with the Model 2130 Weather Sensor Interface, the 2140 and 2142 allow the following to be measured:

Overall

- Current wind speed and direction.
- Current, average, extremes, and number of exceedances of user threshold for temperature and humidity.

Overall and Daily

- Average wind speed.
- Speed, time, and direction of maximum gust.
- Percentage and number of times above user-set windy threshold.
- Percentage of windy time from each of eight compass points.

Interval and Durling Sound Level Exceedance

- Average wind speed.
- Maximum gust speed and direction.
- Extremes of temperature and humidity (average values for interval only)

Acoustic measurements can be paused while wind speed, temperature, or humidity exceed user-set levels.

Model 2130 Weather Interface

The 2130 solves the problem of connecting meteorological sensors to the 870 by (1) scaling and offsetting the linear output of the sensors to meet the 0 to 5 Vdc input range of the 870's A:D channels and (2) converting the wind monitor's sinusoidal speed output to a square wave.

Model 2140 Wind Speed and Direction Monitor

The 2140 permits wind data collection that can be used to qualify noise measurements made with the Model 870. High performance components result in excellent fidelity, low threshold, and fast response.

The wind speed sensor is a four blade propeller that induces a sinusoidal ac voltage with frequency proportional to wind speed.

To record wind direction, the vane position is translated into a voltage by a precision potentiometer, the reference voltage of which is provided by the Model 870.

Originally designed for use with ocean buoys, the 2140 has a highly corrosion resistant construction. A UV stabilized thermoplastic body and stainless steel and anodized aluminum fittings improve its resistance to environmental pollutants.

Model 2142 Temperature and Humidity Sensor

Housed in a lightweight thermoplastic radiation shield, the 2142 minimizes direct and reflected solar radiation for accurate temperature measurements. Tests with maximum radiation and an airspeed of 1 m/s showed < 1.5 °C variation from ambient temperature. The 2142 can measure temperatures ranging from - 30 to 70 °C. The actual floor and ceiling of the range depend on the scale and offset used at the 2130 interface and the A:D channel parameters. Temperature measurements are very stable, making calibration unnecessary under normal circumstances.

The 2142's fast time constant makes precise humidity readings possible. Humidity calibration may be performed with humidity standard solutions.

Mountings

The 870, 2130, and peripherals can be mounted in a compactly designed environmental enclosure (Model 2170 or 2171) with various power options available.

Both sensors can be mounted on the Model 2151 Sensor Mount, which bolts to the side of the Model 2150 Pole. With the Model 2100 Outdoor Microphone System, the pole provides a 20 ft microphone height. The pole is center hinged to allow easy access to the microphone and sensor systems.

Specifications*

<u>Model 2130</u>	<u>Model 2140</u>	<u>Model 2142</u>
<p>Wind Speed Output Voltage 0 to 5 V square wave</p> <p>Input: Sensitivity 0.085 V_{p-p} Impedance 10 KΩ 0.01μF differential 5 KΩ each input to ground</p> <p>Frequency Range dc to 60 kHz Max. Voltage 6.0 V</p> <p>Wind Direction Time Constant 0.001 s Reference Supplied by Model 870, 5.0 V \pm 5% Input: Voltage Range 0 to 5.0 V</p> <p>Sensors A and B Gain Range 0 to 10 Offset Range \pm 3.25 V Frequency Response dc to 12 Hz Output range 0 to 10.5 V (should be limited to 0 to 5 V for input to Model 870 A/D channels)</p> <p>Electrical Power Protection 9 to 15 V, 10 mA Wind speed and direction \leq -0.7 V and \geq 6.4 V clamp to earth ground with 600 W peak pulse Sensors A and B \pm 19 V clamp to earth ground with 600 W peak pulse</p> <p>Physical Height 7.5 cm (4.0 in) Width 10.5 cm (5.5 in) Depth 3.0 cm (1.2 in) Weight 241 g (8.5 oz)</p>	<p>Signal Output Wind Speed Magnetically induced ac voltage. Three pulses per revolution converted by the Model 2130 Interface and Model 870 Analyzer to Hz, mph, fps, km/hr, m/s, and knots Wind direction Analog dc voltage from conductive plastic potentiometer. Resistance 10 KΩ Linearity 0.25 % Life 50M rev. Cable The 2140 is connected to the Model 2130 Weather Interface by a 20 ft, five connector cable.</p> <p>Range Wind speed 0 to 60 m/s (134 mph) Gust speed 80 m/s (180 mph) Direction 360° mechanical, 355° electrical (5° open)</p> <p>Threshold Propeller Vane 0.6 m/s (1.3 mph) 0.9 m/s (2.0 mph) at 10° displacement</p> <p>Physical Height 37 cm (14.6 in) Length 55 cm (21.7 in) Propeller dia. 18 cm (7.1 in) Weight 1.3 kg (2.8 lb) Mounting dia. 34 mm (1.34 in) (standard 1 in pipe)</p>	<p>Temperature Range -30 to 70 °C, linear Accuracy \pm 0.35 °C (antire range) Precision 0.1 °C, long term stable Time constant 10 s Linear output -0.5 to 1.5 Vdc = -50 to 150 °C</p> <p>Humidity Range 0 to 100 % RH, linear Accuracy at 25 °C \pm 1 % RH in reference to calibration Precision < 0.5 % RH, long term stable Time constant < 10 s at 25 °C Error due to temp. \pm 0.5% RH/Δ 70 °C Linear output 0 to 1 Vdc = 0 to 100 % RH</p> <p>Electrical Power 8 to 30 Vdc, 15 mA max. Cable The 2142 is connected to the Model 2130 Weather Interface by a 20 ft, five connector cable.</p> <p>Physical Height 27 cm (10.6 in) Diameter 12 cm (4.7 in) Weight 1.13 kg (2.5 lb) Mounting V-block with U-bolt fit a 25 to 50 mm (1 to 2 in) pipe</p> <p style="font-size: small;">*All specifications are subject to change. †Outputs can be scaled and offset by the 2130 Weather Interface to provide the chosen range and accuracy for the 870 A/D channels.</p>



Model 2100K Specifications (Outdoor Preamp Kit)

Included Components

Preamplifier (2100)

Frequency: -3 dB at 1 Hz; ± 0.1 dB to 200 kHz
Gain: -0.05 dB
Input impedance 10 G Ω // 0.3 pF
Output impedance: < 50 Ω
Max rms out: 3.7 V with Model 870 sound level meter
(10 V with Model 2201 amplifier)
Noise with Model 870 and 18 pF on input (2540 mic):
A-weight: 29 dB SPL
C-weight: 27 dB SPL
Flat (1 Hz to 35 kHz): 32 dB SPL
Quiescent Current: 5 mA typ.

Resistive Heater

Operating power: 8 to 14 Vdc (75 mA at 12 Vdc),
160 Ω , 0.9 W
Turn-on: 0 Vdc, 45 μ A into open collector

Electrostatic Actuator

Output: 391 Vac at 500 Hz (provides 90 dB SPL at
1 kHz)
Operating power: 5 to 18 V (60 mA at 12 V),
70 μ A when off
Turn-on: 4 to 15 Vdc (20 μ A at 5 V)

Desiccant (dehumidifier)

17.5 g blue silica gel (7 capsules @ 2.5 g) with ex-
pected life of 6-12 mo (replacement required when
gel turns pink)

Rainhat (2110)

Windscreen (2120)

Windscreen Insert (2120-1)

Recommended Components

Model 870 Noise and Vibration Monitor

Dynamic range: 115 dB
Data storage: 64K
Interface: RS-232
Frequency range: 1 Hz to 35 kHz
High and low pass Filters

Microphone (Model 2540)

1/2 in. free-field condenser, 18 pF (diaphragm impervi-
ous to nitric acid, sulfuric acid, hydrochloric acid, and
salt)

Cables for Model 870 Sound Level Meter

20 ft preamp cable (2100-C01)
20 ft control cable (2100-C02)

Calibration

Electrostatic actuator built into rainhat provides 90 dB
at 1 kHz (± 2 Hz) (initiated from remote station or by
870)

Environmental

Temperature Range

-35 to 70 $^{\circ}$ C (-31 to +158 $^{\circ}$ F)

Humidity Range

0 to 100 % relative humidity

Physical

Mounting Screw Thread

1 1/2 in NPT (shock mounting built in)

Dimensions (not including windscreen)

Preamp diameters:
Top: 13.3 mm (1/2 in)
Middle: 26.7 mm (1 in)
Bottom: 76.2 mm (3 in)

Lengths:

Over all (top of birdspikes): 1092 mm (43.0 in)
Preamp: 918 mm (35.8 in)

Weight:

3 kg (6.6 lb)

Connectors

Signal (female, mates with Switchcraft TA5ML)

Pin	Purpose
1	Ground
2	Signal output
3	-9 V
4	Microphone bias
5	+9 V

Control (male, mates with Switchcraft TA5FL)

Pin	Purpose
1	Ground
2	+12 V
3	Electrostatic actuator control
4	Heater control
5	Not used