Introducing FlightStat

The FlightStat® Pulse Oximeter is a very small, lightweight device that measures blood oxygen saturation (%SpO_2) and pulse rate. FlightStat provides useful information to anyone flying at any altitude. It can be used safely in all unpressurized or pressurized aircraft. FlightStat displays %SpO_2 and pulse rate on light-emitting diode (LED) numeric displays. When each pulse is detected, the pulse quality display blinks. FlightStat is designed for use on most fingers, but the index finger is preferred. When using FlightStat, minimize finger motion as much as possible. (Excessive motion might cause erratic results.)

Two AAA-size batteries power FlightStat for approximately 1,600 spot checks (calculated at 40 seconds per spot check using alkaline batteries) or 18 hours of continuous operation. When the batteries are low, the numeric displays will flash once per second. FlightStat will automatically shut off (to conserve battery life) approximately 10 seconds after the finger is removed, or after a 2-minute period of inadequate pulse signals.

- ### Blood Oxygen Saturation Display
  Numeric LEDs display blood oxygen saturation in percent (indicated by the %SpO_2 icon).
- ### Pulse Rate Display
  Numeric LEDs display pulse rate in pulses per minute (indicated by the heart icon).
- ### Pulse Quality Display
  The tri-color LED display provides a visual indication of the pulse signal quality, while blinking at the corresponding pulse rate. This display changes colors to alert you to changes in pulse quality that may affect the readings.

  Green = a good pulse signal **Yellow** = a marginal pulse signal **Red** = an inadequate pulse signal
- ### Back Cover
  The back cover shows the device serial number and the correct battery position for insertion.

Precautions for Use

Warnings

- Experts in the diagnosis and treatment of altitude-related illnesses have cautioned that while potentially life-threatening medical complications may occur at lower altitudes, they become more likely above 8,000 feet (2,440 meters) and are much more frequent at altitudes above 12,000 feet (3,660 meters). This is true even for those who are physically fit and well acclimatized. Interpretation of %SpO_2 values at high altitudes should only be done in conjunction with expert medical advice.
- If you have a pre-existing medical condition, seek medical advice before participating in any activities at altitudes higher than where you live.
- FlightStat Pulse Oximeter readings should be considered approximate measurements only and are not intended for medical use.
- This device *will not* detect carbon monoxide (CO) in the blood. Use separate equipment if you are concerned about elevated levels of carbon monoxide.
- *Do not* attempt to read the FlightStat displays while performing any activity that requires your full attention.
- Keep FlightStat away from small children. It contains small parts that may pose a choking hazard.
- Operation of this device below the minimum amplitude of 1.2% modulation may cause inaccurate results.
- This device should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the device should be observed carefully to verify normal operation.
- The use of accessories other than those specified by NONIN may result in increased emission and/or decreased immunity of this device.

Cautions

- Read this entire manual carefully before using the FlightStat Pulse Oximeter.
- The FlightStat Pulse Oximeter is designed to determine the percentage of arterial oxygen saturation of functional hemoglobin. Significant levels of dysfunctional hemoglobin such as carboxyhemoglobin or methemoglobin may affect the accuracy of the measurement.
- This equipment complies with International Standard EN 60601-1-2:2001 for electromagnetic compatibility for medical electrical equipment and/or systems. This standard is designed to provide reasonable protection against harmful interference in a typical medical installation. However, because of the proliferation of radio-frequency transmitting equipment and other sources of electrical noise in healthcare and other environments, it is possible that high levels of such interference due to close proximity or strength of a source might disrupt the performance of this device. Medical electrical equipment needs special precautions regarding EMC, and all equipment must be installed and put into service according to the EMC information specified in this manual.
- Portable and mobile RF communications equipment can affect medical electrical equipment.
- Batteries may leak or explode if used or disposed of improperly.
- Remove the batteries to avoid the risk of leakage if FlightStat is going to be stored for more than one month.
- Do not use different types of batteries at the same time, and do not mix fully- and partially-charged batteries at the same time. These actions may cause batteries to leak. Follow local governing ordinances and recycling instructions regarding disposal or recycling of batteries.
- FlightStat may misinterpret motion as good pulse quality (as indicated by a green pulse quality display). Always hold your finger still while using FlightStat.
- Nail polish or artificial nails may reduce light transmission through the finger, affecting %SpO_2 accuracy. Remove polish or artificial nails before using FlightStat.
- FlightStat may not work on a cold finger because of reduced circulation. Warm up or rub your finger to increase circulation, or try re-positioning FlightStat.
- A flexible circuit/strain relief connects the two halves of FlightStat. Do not twist or pull on the flexible circuit/strain relief.
- Do not immerse FlightStat in liquid, and do not use caustic or abrasive cleaning agents on FlightStat.
- The FlightStat Pulse Oximeter is a precision electronic instrument and must be repaired by trained NONIN personnel only.
- It may be difficult to read the FlightStat displays in very bright light. Shield the displays with your hand, or re-position FlightStat.
- Indicates separate collection for electrical and electronic equipment (WEEE). In compliance with the European Directive on Waste Electrical and Electronic Equipment (WEEE) 2002/96/EC, do not dispose of this product as unsorted municipal waste. This device contains WEEE materials; please contact your distributor regarding take-back or recycling of the device. If you are unsure how to reach your distributor, please call Nonin for your distributor's contact information.

How FlightStat Works

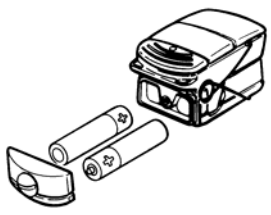
The FlightStat Pulse Oximeter transmits red and infrared light through the finger and detects the fluctuating signals caused by blood flow. The pulse rate is determined from the signals received by a photodetector. (If the photodetector does not sense an adequate amount of light, FlightStat will not function properly.) The ratio of the fluctuation of the red and infrared light signals is used to calculate the blood oxygen saturation (%SpO_2) of hemoglobin and is expressed as a percentage. For example, a %SpO_2 reading of 97 indicates that 97% of the hemoglobin molecules are carrying oxygen. At higher altitudes, blood oxygen saturation (%SpO_2) decreases because of reduced atmospheric pressure. In addition, pulse rate often increases as a normal compensatory mechanism.

Note: Using supplemental oxygen at higher altitudes can prevent dangerous decreases in arterial oxygen saturation. The FlightStat may be used to indicate that oxygen saturation is being maintained while on supplemental oxygen.

Using FlightStat

Use two 1.5-volt AAA-size batteries to power FlightStat. NONIN recommends alkaline batteries (included with each new FlightStat). The numeric displays will flash once per second when the batteries are low. Replace low batteries as soon as possible.

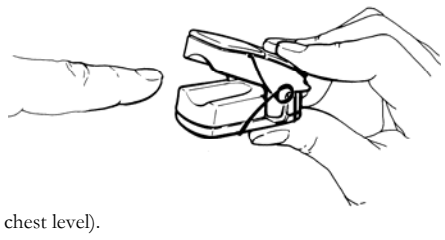
Inserting New Batteries



1. Loosen the screw at the end of the FlightStat using a coin or a standard flat screwdriver. Remove the battery door.
2. Remove the old batteries and dispose of them properly.
3. Insert two new 1.5-volt AAA-size batteries. Follow the polarity markings (+ and -) as indicated on the back cover. *Proper positioning of the batteries is essential for FlightStat to operate.*
4. Carefully re-position the battery door. *Do not force the door into place;* it fits only when properly positioned.
5. Tighten the screw firmly. However, to avoid stripping the screw threads, *do not* tighten the screw excessively.
6. Insert your finger into FlightStat. If the unit does not turn on, remove your finger and wait a few seconds before reinserting your finger.
7. If FlightStat still does not turn on, reinsert the batteries.

Note: Rechargeable nickel cadmium or nickel-metal hydride batteries may be used. However, rechargeable batteries need more frequent replacement.

Activating FlightStat



Activate FlightStat by inserting your index finger into the unit. FlightStat detects the inserted finger and automatically illuminates the displays. Correct positioning of FlightStat's light emitter and photodetector on the finger is critical for accurate measurements. All emitted light must pass through the fingertip before reaching the photodetector. Do not position FlightStat such that some or all of the emitted light bypasses the finger—this could result in inaccurate values. While on the finger, do not press FlightStat against any surface and do not squeeze or hold FlightStat together. The external spring provides the correct amount of pressure on the finger. Additional pressure may cause inaccurate readings.

Note: FlightStat performs best when used on fingers (other than the thumb) between 0.3 to 1.0 inch (0.8 to 2.5 cm) thick. The index finger is the recommended site.

1. Insert your finger, nail side up, into FlightStat until your fingertip touches the built-in stop guide.
2. Make sure your finger is lying flat (not on its side) and is centered within FlightStat. For best results, keep FlightStat at about the same level as your heart (at chest level).
3. If FlightStat does not turn on, remove your finger and wait a few seconds before reinserting it.

Note: FlightStat will automatically shut off (to conserve battery life) approximately 10 seconds after the finger is removed, or after a 2-minute period of inadequate pulse signals.

Verifying FlightStat Operation

1. When your finger is first inserted, FlightStat performs a brief startup sequence.
2. After completing this sequence, FlightStat begins sensing the pulse (indicated by the blinking pulse quality display).
3. Allow FlightStat to stabilize. Observe approximately 10 seconds of continuous green-colored pulse quality display blinking before relying on the displayed values. It is common for the displayed values to fluctuate slightly over a period of several seconds.
4. If the pulse quality display blinks yellow or red, try another finger. Squeezing or putting pressure on FlightStat can result in yellow or red blinking.
5. If you are unable to achieve stable readings, remove FlightStat and contact NONIN Customer Support.

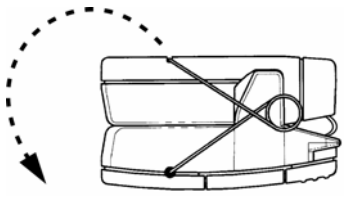
The following factors may degrade FlightStat's performance:

- fluctuating or very bright light
- moisture
- a finger thickness outside the 0.3 to 1.0 inch (0.8 to 2.5 cm) range
- not at heart level
- insufficient pulse signal
- anemia or a low hemoglobin count
- interference from electrical equipment

FlightStat Care and Maintenance

The advanced digital circuitry within FlightStat requires no adjustment (calibration) or periodic maintenance other than battery replacement. Field repair of the FlightStat circuitry is not possible. Do not attempt to open the FlightStat case or repair the electronics. Opening the case will damage FlightStat and void the warranty. Use and store your FlightStat within the stated environmental specifications.

Disengaging and Removing the Spring



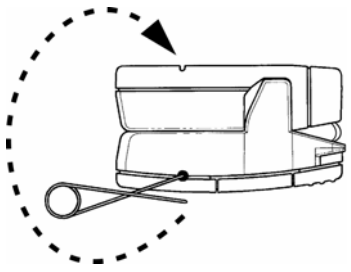
The two halves of FlightStat are held together by a flexible circuit and strain relief. Hold FlightStat's top and bottom together when the spring is disengaged.

1. Turn FlightStat over with the back cover facing up.
2. Disengage the spring by gently pulling it up and lifting it out of the retaining groove. Next, rotate the spring forward (as indicated by the dashed arrow), bringing it past the finger cavity.

(The next step is only required when replacing the spring:)

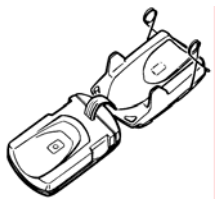
3. Remove the spring by carefully pulling the ends from the pivot holes on either side. If the spring is lost, bent, or over-extended, contact NONIN Customer Support for replacement.

Replacing the Spring



1. Insert the ends of the new spring into the pivot holes on both sides of FlightStat. Make sure that the spring is positioned as indicated in the illustration.
2. Rotate the spring up and past the finger cavity (as indicated by the dashed arrow).
3. Seat the spring into the retaining groove.

Cleaning FlightStat



1. Disengage the spring. It is not necessary to completely remove the spring.
2. Wipe the exposed surfaces with a soft cloth dampened with a mild detergent solution or an isopropyl alcohol solution.
3. Dry with a soft cloth or allow to air dry.
4. Make sure that all surfaces are completely dry, then re-engage the spring.

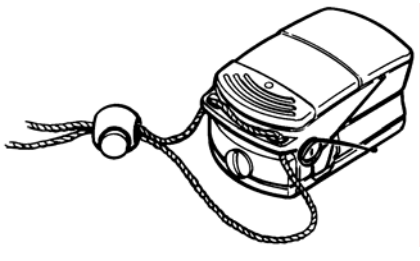
Replacing the Gripping Insert

A gripping insert is adhered to the upper inner surface of FlightStat to provide a more secure fit to the finger. Replace the gripping insert if it becomes torn or damaged, or if it begins to peel off. FlightStat will function without the gripping insert. However, NONIN recommends using the insert during normal operation.

1. Disengage the spring. It is not necessary to completely remove the spring.
2. Carefully peel the old gripping insert away from the surface.
3. Remove any residual adhesive with a soft cloth dampened with an isopropyl alcohol solution.
4. Peel the backing paper off the new gripping insert, uncovering the adhesive back.
5. Position the new insert (with the adhesive side toward FlightStat) and gently press it in place.
6. Re-engage the spring.

Using the Lanyard

A lanyard is provided for convenience. FlightStat will function with or without the lanyard. *Do not* thread the lanyard through the flexible circuit/strain relief!



Attaching the Lanyard

1. If lanyard use is desired, thread the ends of the lanyard through the lanyard holes.
2. Push in the lanyard lock button. Slide the lock onto the lanyard to the desired length.
3. Release the lock button to secure its position.
4. Reverse this procedure to remove the lanyard.

Note: The lanyard must cross over the top of FlightStat (it must be threaded as illustrated) to permit the full opening of the device.

Specifications

Oxygen Saturation Range (%SpO_2)	0% to 100%
Pulse Rate Range	18 to 300 pulses per minute
Displays	
Numeric Displays	Two 3-digit 7-segment LEDs (light-emitting diodes)
Pulse Quality Display	Tri-color LED
Measurement Wavelengths	
Red	660 nanometers
Infrared	910 nanometers
Accuracy	
Blood Oxygen Saturation (%SpO_2) (± 1 S.D.)*	70% to 100% ± 2 digits
Pulse Rate	± 3%
Temperature	
Operating	+32° to +122°F (0° to +50°C)
Storage/Transportation	-22° to +122°F (-30° to +50°C)
Humidity	
Operating	10% to 90% noncondensing
Storage/Transportation	10% to 95% noncondensing

Altitude	
Operating Altitude	Up to 40,000 feet (12,192 meters)
Hyperbaric Pressure	Up to 3 atmospheres
Power Requirements	Two 1.5 volt AAA-size batteries
Battery Life	
Operating	Approximately 18 hours of continuous operation, using two AAA-size alkaline batteries; based on approximately 1,600 spot checks calculated at 40 seconds per spot check.
Storage	9 months typical, using two AAA-size alkaline batteries.
Dimensions	1.3″ w. x 1.3″ h. x 2.2″ l. (3.3 x 3.3 x 5.7 cm)
Weight	2 oz (60 g) with batteries

* S.D. (Standard Deviation) is a statistical measure; up to 32% of the readings may fall outside these limits.

Service and Support

The FlightStat Pulse Oximeter performs all computations from internal software stored in microprocessor chips. Thus, there are no critical parts to drift, and no re-calibration is required. For information about the FlightStat and accessories, contact your local retailer or NONIN's Customer Support Department. A return authorization number is required before returning any product to NONIN. To obtain this return authorization number, contact NONIN Customer Support:

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Warranty

NONIN MEDICAL, INCORPORATED, (NONIN) warrants to the purchaser, for a period of one year from the date of purchase, each FlightStat exclusive of the batteries, spring, carrying case, lanyard, and lanyard lock. NONIN shall repair or replace any FlightStat found to be defective in accordance with this warranty, free of charge, for which NONIN has been notified by the purchaser by serial number that there is a defect, provided said notification occurs within the applicable warranty period. This warranty shall be the sole and exclusive remedy by the purchaser hereunder for any FlightStat delivered to the purchaser which is found to be defective in any manner whether such remedies be in contract, tort or by law. This warranty excludes cost of delivery to and from NONIN. All repaired units shall be received by the purchaser at NONIN's place of business. NONIN reserves the right to charge a fee for a warranty repair request on any FlightStat that is found to be within specifications.

FlightStat is a precision electronic instrument and must be repaired by knowledgeable and specially trained NONIN personnel only. Accordingly, any sign or evidence of opening the FlightStat, field service by non-NONIN personnel, tampering, or any kind of misuse or abuse of the FlightStat, shall void the warranty in its entirety. All non-warranty work shall be done according to NONIN standard rates and charges in effect at the time of delivery to NONIN.

DISCLAIMER/EXCLUSIVITY OF WARRANTY:
THE EXPRESS WARRANTIES SET FORTH IN THIS MANUAL ARE EXCLUSIVE AND NO OTHER WARRANTIES OF ANY KIND, WHETHER STATUTORY, WRITTEN, ORAL, OR IMPLIED INCLUDING WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY SHALL APPLY.

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