

NASAL RANGER® FIELD OLFACTOMETER OPERATIONS MANUAL

Version 7.2



U.S. Patent No.: 6,595,037



St. Croix Sensory, Inc.

www.fivesenses.com
stcroix@fivesenses.com
1-651-439-0177

NASAL RANGER[®] FIELD OLFACTOMETER

OPERATIONS MANUAL v7.2

TABLE OF CONTENTS

Safety and Maintenance	1
Introduction to Field Olfactometry	2
What's Included in Your Bag	3
Component Diagram	4
Quick Start Guide	5
Test Procedure Flow Chart	6
Operating Principle	7
Application Guide	9
Nasal Mask: Instructions for Use and Maintenance	11
Odor Filter Cartridges: Instructions for Use and Maintenance	13
Troubleshooting Guide	15
Accessories	16
Technical Specifications	17
Sales Terms and Conditions	18
Odor Descriptor Examples	20
Odor Monitoring Data Sheet	21
Registration Form	22

SAFETY AND MAINTENANCE

Safety Precautions

- Obtain proper permission to use the Nasal Ranger® Field Olfactometer at the desired locations and be familiar with your surroundings before using the Nasal Ranger® Field Olfactometer.
- The Nasal Ranger® Field Olfactometer and its related products should not be used for anything other than its intended purpose.
- The Nasal Ranger® Field Olfactometer is not to be used as a respirator for the reduction or elimination of hazardous chemicals in the air.
- Do not use the Nasal Ranger® Field Olfactometer in atmospheres where contaminant concentrations are unknown, immediately dangerous to life/health, or exceed applicable local standards.
- Do not use the Nasal Ranger® Field Olfactometer in atmospheres that contain less than 19.5% oxygen.
- The Nasal Ranger® Field Olfactometer should not be misused, altered, disassembled, or neglected.
- Use the Nasal Ranger® Field Olfactometer in a stationary position. Do not walk with the unit held up to your nose. Remove the unit from your nose before moving to the next measurement location.
- The Nasal Mask is fragile and can break if dropped onto a hard surface. If the Nasal Mask is cracked or broken, discontinue use, as usage of a broken mask could result in injury to the face. Discard the broken mask and replace with a new one.
- Please refer to pages 7-8 *Operating Principle* of this manual for proper operating procedures.

Maintenance

- Odor Filter Cartridges should be replaced every 200 hours of field use, or if an odor is detected while sniffing through a blank position. See page 13 *Odor Filter Cartridges: Instructions for Use and Maintenance* for more information.
- The Nasal Mask should be cleaned with the provided isopropyl alcohol wipes as needed, such as when a new operator uses it, or if an odor is detected on it. See pages 11-12 *Nasal Mask: Instructions for Use and Maintenance* for more information.
- Comfort seals should be replaced when a new operator uses the mask, or if an odor is detected on them.
- Mask O-rings should be replaced when any leaks occur between the Nasal Ranger® Field Olfactometer and the Nasal Mask.
- The barrel of the Nasal Ranger® Field Olfactometer should be cleaned with the included barrel brush when visible debris is present. To clean the barrel, take the mask off, turn the dial to the blank position, lightly insert the brush into the barrel until it reaches the dial, and pull the brush out while giving a slight twist.
- If a defect with the Nasal Ranger® Field Olfactometer should appear during the warranty period, please refer to the *Warranty Service Procedures* section of page 18 *Sales Terms and Conditions*.

If you have any questions about proper usage or safety regarding the Nasal Ranger® Field Olfactometer, please contact St. Croix Sensory, Inc. at 1-651-439-0177, or visit www.fivesenses.com/nasalranger.

INTRODUCTION TO FIELD OLFACTOMETRY

Thank you for joining the ranks of Nasal Ranger® Field Olfactometer owners! This instrument allows one to confidently measure and quantify odor strength in the ambient air with the state-of-the-art in field olfactometry. A portable odor detecting and measuring device, The Nasal Ranger® Field Olfactometer determines ambient odor **dilution to threshold (D/T)** values objectively. This instrument is precision calibrated and will yield reliable odor strength results for your monitoring and measurement needs. The Nasal Ranger® Field Olfactometer, as a nasal organoleptic instrument, provides field olfactometry using a scientific method, resulting in dependable ambient odor quantification.

Be sure to register your Nasal Ranger® Field Olfactometer by completing the Registration Form (page 22) and emailing, faxing, or mailing the form as instructed. Your registration will allow us to better serve you with product updates and important information regarding your Nasal Ranger® Field Olfactometer. Note that the serial number of your Nasal Ranger® Field Olfactometer can be found on the underside of the battery compartment door.

Field olfactometry can be used as a proactive monitoring or enforcement tool for confident odor measurement at property lines and in the neighboring community. Quantifying ambient odor is often needed for the following purposes:

1. Monitoring daily operations (e.g. management performance evaluations)
2. Comparison of operating practices (e.g. evaluating alternatives)
3. Documenting specific events or episodes (e.g. defensible, credible evidence)
4. Monitoring compliance (e.g. compliance assurance for permits)
5. Determination of compliance (e.g. permit renewal)
6. Determination of status (e.g. baseline data for expansion planning)
7. Investigation of odor control effectiveness (e.g. scientific testing)
8. Verification of odor dispersion modeling (e.g. model calibration)
9. Determination of specific odor sources (e.g. investigation of complaints)
10. Verification of complaints (e.g. notice of violation)

In 1958, the U.S. Public Health Service sponsored the development of an instrument and procedure for field olfactometry (ambient odor strength measurement) through Project Grants A-58-541, A-59-541, and A-60-541. The Barnebey-Cheney Company originally manufactured a field olfactometer instrument based on these grants, referring to it as a 'scentometer'.

The Nasal Ranger® Field Olfactometer creates a calibrated series of discrete dilutions by mixing the odorous ambient air with odor-free carbon filtered air. Field olfactometry defines each discrete dilution level as a dilution to threshold (D/T) ratio. The dilution to threshold ratio is a measure of the number of dilutions needed to make the odorous ambient air non-detectable.

Field olfactometry calculates the **dilution to threshold (D/T)** ratio as:

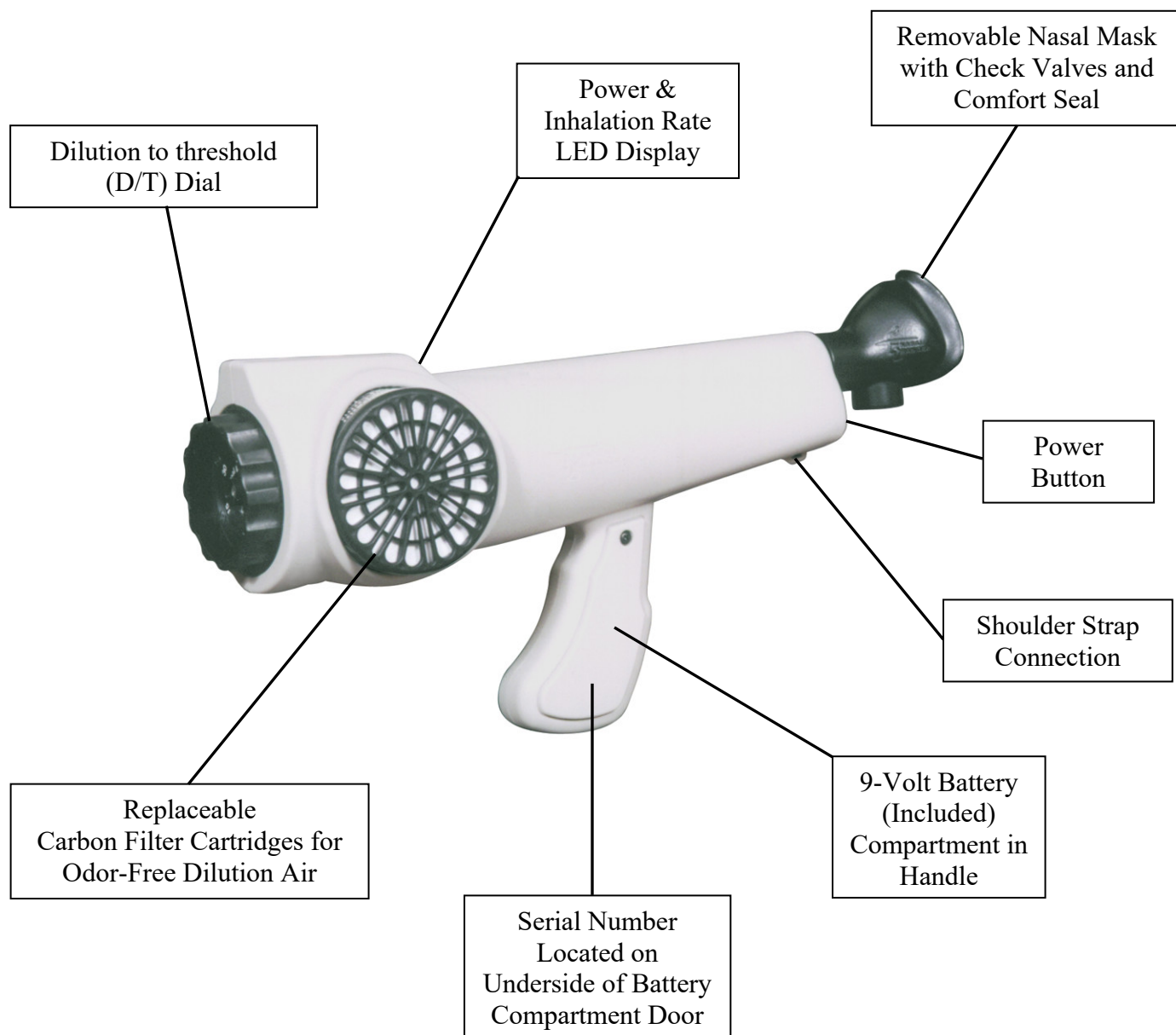
$$\text{D/T} = \frac{\text{Volume of Carbon Filtered Air}}{\text{Volume of Odorous Air}}$$

WHAT'S INCLUDED IN YOUR BAG



1. Nasal Ranger® Field Olfactometer with a Pair of Installed Type I Universal Odor Filter Carbon Cartridges (NR0001)
2. 1 Wrapped Pair of Type I Universal Odor Carbon Cartridges (NR0081)
3. Barrel Cleaning Brush (NR0031)
4. 10 pack of Nasal Mask Comfort Seals (NR0062)
5. 10 pack of Isopropyl Alcohol Cleaning Wipes (NR0063)
6. Nasal Mask with Leak Test Stopper in Pouch (NR0046)
7. Carry Bag Strap (NR7021)
8. Phillips Head Screwdriver (NR0025)
9. 2 Spare Pairs of Nasal Mask O-Rings (NR0020)
10. Nasal Ranger® Field Olfactometer Strap (NR7020)

COMPONENT DIAGRAM



QUICK START GUIDE

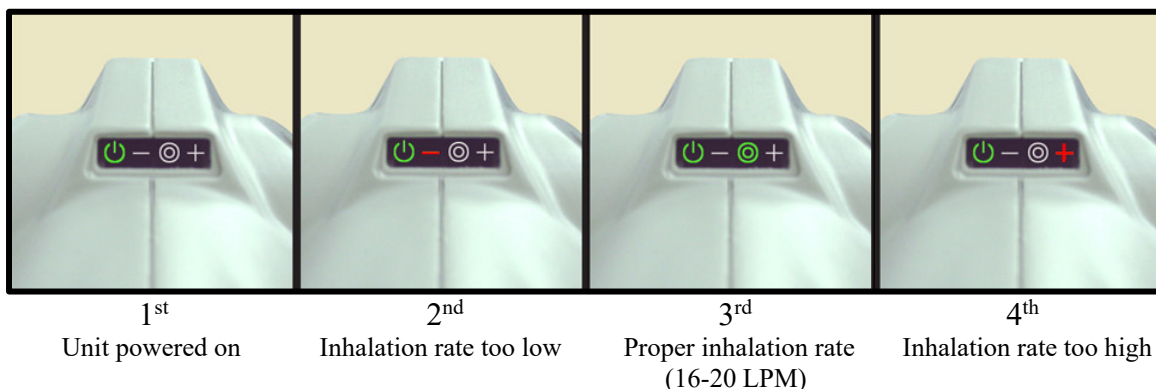
Field olfactometry with the Nasal Ranger® Field Olfactometer is a cost-effective means to quantify odor strength. Facility operators, odor scientists, and community inspectors can confidently monitor odor strength at specific locations, such as an industrial facility's property line, the manufacturing area of a production building, and within neighborhoods and public land.

The following information allows an informed user to quickly understand the operation of the Nasal Ranger® Field Olfactometer. It assumes the user has some familiarity with field olfactometry and odor monitoring concepts. See pages 7-8 *Operating Principle*, and page 9 *Application Guide*, for more information.



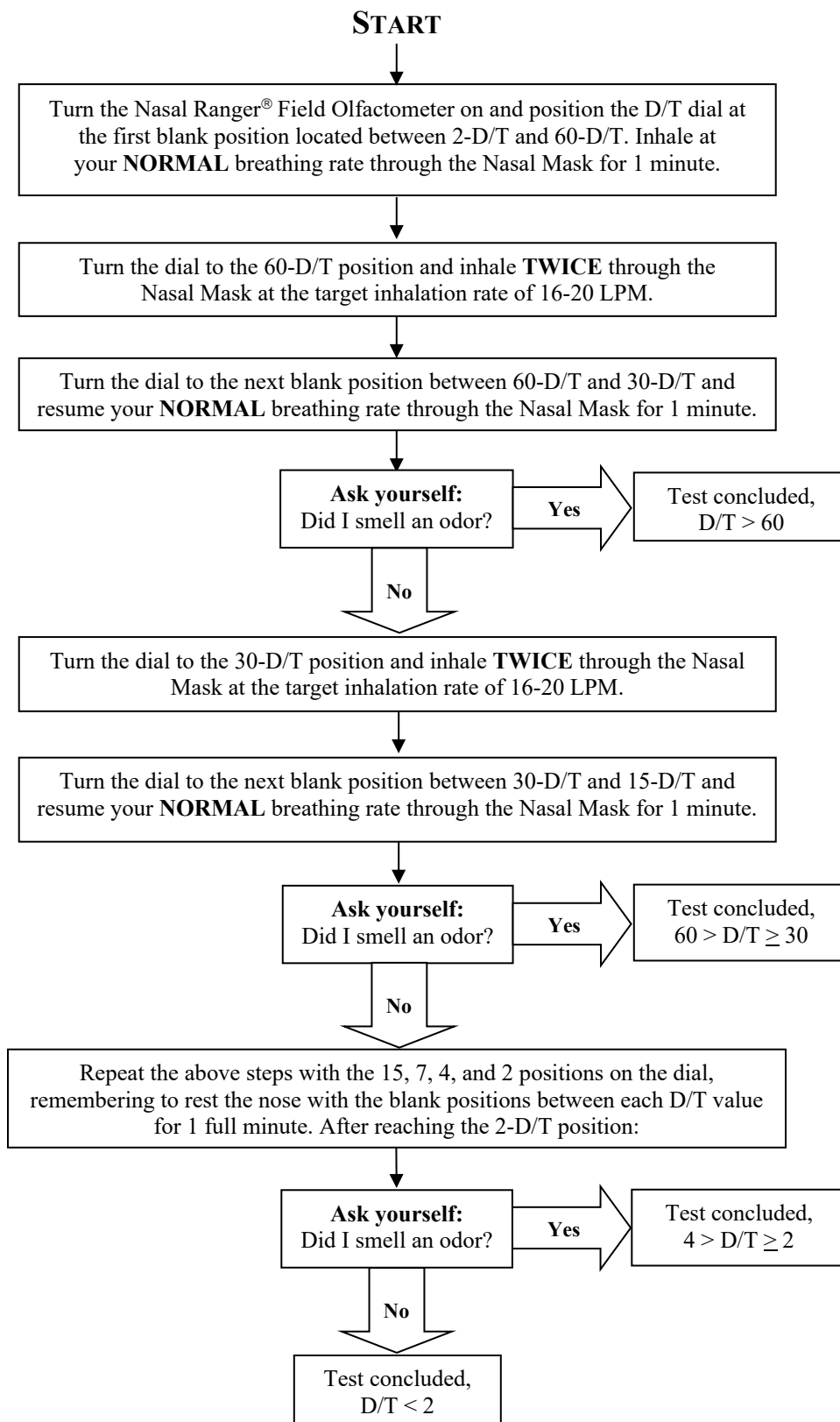
To Use the Nasal Ranger® Field Olfactometer:

1. Turn the Nasal Ranger® Field Olfactometer on by pressing the power button located below the Nasal Mask nozzle. All four LED lights should illuminate for one second, and then the 1st (leftmost) Power LED will remain illuminated.
2. Follow the Test Procedure Flow Chart on the following page, holding the unit as shown in the picture above.
3. Ensure your inhalation rate is within specification. The LED display on the Nasal Ranger® Field Olfactometer provides feedback for the user to inhale at the factory calibration flow rate of 16-20 liters per minute (LPM). The LEDs indicate the following:



After 45 seconds of inactivity, the LEDs will turn off to conserve power. The 1st LED will periodically blink during this time to indicate that the unit is still powered on. After 5 minutes of inactivity, the unit will automatically power down fully. To turn the Nasal Ranger® Field Olfactometer off manually, press and hold the power button for three seconds. All four LEDs will illuminate and then turn off. The Nasal Ranger® Field Olfactometer is now powered down.

TEST PROCEDURE FLOW CHART



OPERATING PRINCIPLE

The Nasal Ranger® Field Olfactometer directly measures and quantifies odor strength in the ambient air using the operating principle of mixing odorous ambient air with odor-free carbon filtered air in discrete volume ratios. These discrete volume ratios are called dilution to threshold ratios (D/T ratios).

The user's nose is placed firmly inside the Nasal Mask against the replaceable Comfort Seal. The user inhales through the Nasal Mask at a comfortable breathing rate while standing at rest. The Nasal Mask has an outlet for exhaled air to exhaust downward, allowing the user to inhale through the device and exhale through the outlet check valve. Note that the user can stand at rest and continue normal breathing exclusively through the Nasal Ranger® Field Olfactometer.

The power button, located directly below the Nasal Mask mounting point, is pushed once by the user to turn the unit on. Holding the button for three seconds will turn the unit off. The unit will also automatically power down after five minutes of inactivity.

A precision electronic flow meter is built into the Nasal Ranger® Field Olfactometer and measures the total volume of airflow that is traveling down the PTFE barrel on the way to the user's nose. A visual representation of this is shown by the four LEDs recessed on top of the Nasal Ranger® Field Olfactometer housing. This display indicates when a user is inhaling within the factory calibration flow rate of 16-20 liters per minute (LPM). The four LEDs specify the following:

1st LED (Leftmost): Indicates that the power is on when lit. After 45 seconds of inactivity, the LED will turn off and periodically blink to conserve power. When airflow is detected, the LED will wake from the power save mode and illuminate fully.

2nd LED: Indicates that the user is inhaling at a flow rate of less than 16 LPM when lit.

3rd LED: Indicates that the user is inhaling at a flow rate between 16 and 20 LPM when lit.

4th LED (Rightmost): Indicates that the user is inhaling at a flow rate of greater than 20 LPM when lit.

To operate the Nasal Ranger® Field Olfactometer correctly, the user must inhale at a rate where only the first and third LEDs are illuminated (16-20 LPM). This ensures that the rate of inhalation is equivalent to the factory calibration flow rate.

The Nasal Ranger® Field Olfactometer's operating principle of mixing odorous ambient air with odor-free filtered air in discrete volume ratios is achieved using two airflow paths:

1. Flow through one of the six orifices in the D/T dial.
2. Flow through the odor filter cartridges.

The first airflow path is unaltered ambient air flowing through a small opening in the D/T dial. The second airflow path takes an alternate route through the pair of odor filter cartridges that are attached to each side of the Nasal Ranger® Field Olfactometer housing. The ambient air which travels through these odor filter cartridges will contact the multimedia carbon inside and be rendered odorless. The two airflow paths then combine into one and travel down the PTFE barrel to the user's nose, which is pressed against the Comfort Seal adhered to the Nasal Mask, creating an airtight seal around the user's face and ensuring that the air mixture from the Nasal Ranger® Field Olfactometer is not being diluted with additional ambient air.

OPERATING PRINCIPLE

(CONTINUED)

The rotational position of the Nasal Ranger® Field Olfactometer D/T dial determines the orifice size and, therefore, the volume of odorous air that enters through the selected orifice. A large orifice allows more odorous air through the D/T dial to mix with odor-free filtered air, and a small orifice allows less odorous air through the D/T dial to mix with odor-free filtered air. The ratio of the volume of filtered odor-free air and the volume ambient odorous air is called the dilution to threshold (D/T) ratio. The principle of field olfactometry calculates this dilution to threshold ratio as:

$$\text{D/T} = \frac{\text{Volume of Carbon Filtered Air}}{\text{Volume of Odorous Air}}$$

The D/T dial contains twelve orifice positions. Six are blank positions, so-called because they close off the airflow path through the D/T dial and allow the user to inhale only odor-free filtered air. Alternating with the six blank positions are the six D/T positions, each having a specific orifice size that allows for discrete dilution to threshold ratios with traceable calibration.

The following table summarizes the twelve positions of the standard D/T dial equipped on the Nasal Ranger® Field Olfactometer:

- 1 - Blank
- 2 - **60-D/T**
- 3 - Blank
- 4 - **30-D/T**
- 5 - Blank
- 6 - **15-D/T**
- 7 - Blank
- 8 - **7-D/T**
- 9 - Blank
- 10 - **4-D/T**
- 11 - Blank
- 12 - **2-D/T**

To indicate the starting position, there is a raised arrow on the rim of the D/T dial, corresponding to the first blank (Position 1). There are also six raised dots on the rim of the dial corresponding to each of the D/T positions.

In addition to the standard dial that ships with the Nasal Ranger® Field Olfactometer, there are also supplementary dials available. Please contact St. Croix Sensory, Inc. with inquiries regarding Nasal Ranger® Field Olfactometer D/T dials with other dilution to threshold ratios.

APPLICATION GUIDE FOR FIELD OLFACTOMETRY

Odor Monitoring

Field olfactometry with the Nasal Ranger® Field Olfactometer is a safe and effective means to quantify odor strength in terms of dilution to threshold (D/T) ratios. Facility operators, city inspectors, and neighborhood citizens can use this instrument to monitor ambient odor strength at specific locations within and around a facility's property line, as well as within the community.

The following example protocols are presented in brief form as possible applications in which the Nasal Ranger® Field Olfactometer might be used.

On-Site Monitoring – Operators have the unique ability to monitor odors throughout the day with field olfactometry. Operator monitoring can include odor observations of arriving materials, outdoor process activities, and fugitive air emissions. On-site monitoring with a Nasal Ranger® Field Olfactometer may include odor observations at predetermined locations, such as open doorways, loading zones, storage areas, and fence lines.

Random Monitoring – A frequently used method for ambient odor monitoring is the inspection of one or multiple areas at random times and intervals. Random monitoring leads to a compilation of data that can be correlated with meteorological conditions and on-site operation activities.

Scheduled Monitoring – Scheduled monitoring can be as informal as a daily walk around the facility, or as structured as multiple visits to predetermined monitoring locations within a specific timeframe. Data from a Nasal Ranger® Field Olfactometer used in this way can be used to correlate the many parameters that influence odor episodes, including meteorological conditions and on-site operation activities.

Intensive Odor Survey – An in-depth evaluation of on-site odor generation and off-site odor impact may be needed for permit renewal or facility expansion. Data collection with the Nasal Ranger® Field Olfactometer can identify which sources or operations cause odors and which ones do not. All potential odor sources and operations could then be ranked, and their relative contributions determined. Short term trials or tests of odor mitigation measures and odor counteractants would also require an intensive period of data collection using a Nasal Ranger® Field Olfactometer.

Citizen Monitoring – The implementation of citizen odor monitoring with Nasal Ranger® Field Olfactometers can be part of an interactive community outreach program. The primary function of citizen odor monitoring could be to collect information, and alongside accurate record keeping, develop a model which represents existing odor conditions within the community. Citizens recruited and trained to measure odors using Nasal Ranger® Field Olfactometers could also report odor descriptors to be used in further data analyzation. Citizen odor monitoring could assist in determining prevalent times and weather conditions of odor episodes, as well as aid in understanding the strength at which an odor first becomes a nuisance.

Complaint Response – The use of 'odor compliant hotlines' is a common method used by facilities and communities to respond to odor episodes. A Nasal Ranger® Field Olfactometer may be used by on-call responders as part of a complaint response plan for verifying odor episodes, tracking odor sources, and quantifying odor strength.

Plume Profiling – Atmospheric dispersion modeling predicts the transport and dilution of odors by the wind, and using a protocol known as odor plume profiling, one could supplement atmospheric dispersion modeling with actual odor measurements from the Nasal Ranger® Field Olfactometer. Several inspectors with Nasal Ranger® Field Olfactometers, spaced crosswind and downwind from an odor source, could measure and record their individual odor strengths as D/T values at set times, thereby creating an odor plume profile. This profile would then be documented and overlaid on a local terrain map, allowing it to be correlated to an atmospheric dispersion model, as well as the local topography.

APPLICATION GUIDE FOR FIELD OLFACTOMETRY

(CONTINUED)

Odor Regulations

The field olfactometer (also referred to as a scentometer) is referenced in a number of existing state odor regulations, alongside dilution to threshold (D/T) terminology and the method for calculating D/T. The exact wording in a regulation is important and often may be stated as either Compliance Criteria or Nuisance Criteria.

Compliance Criteria: "...compliance if the ambient air is less than 7 D/T."

Nuisance Criteria: "...nuisance if the ambient air is equal to or greater than 7 D/T."

In these two examples, if an air pollution inspector observed an odor with a field olfactometer set at a 7 D/T, the odor would meet the criteria for nuisance and the ambient air would be noncompliant. Odor regulations that utilize field olfactometry with a calibrated field olfactometer such as the Nasal Ranger® Field Olfactometer may also define the number of observations needed, as well as the time frame of the observations. For example, a regulation may read:

"Two field olfactometer observations in a one-hour period separated by at least 15 minutes each."

Or

"Two field olfactometer observations not less than 15 minutes apart within a one-hour period."

Note that the example protocols in this Application Guide for Field Olfactometry are presented in brief form and are not mutually exclusive, often being integrated into a comprehensive odor management program with several different protocols included. In addition, though derived from actual odor regulations, the example criteria for compliance and nuisance shown here are presented as examples only and are not meant to represent or inform any current or future legislation.

If you have any questions, need additional information about the use and application of the Nasal Ranger® Field Olfactometer, or would like referral to industry or regulatory specialists, please contact St. Croix Sensory, Inc. at 1-651-439-0177, or visit www.fivesenses.com/nasalranger.

NASAL MASK:

INSTRUCTIONS FOR USE AND MAINTENANCE

The Nasal Ranger® Nasal Mask is specifically designed for use with the Nasal Ranger® Field Olfactometer. It is made of a carbon fiber epoxy polymer with a polytetrafluoroethylene (also known as PTFE or Teflon) coating. There are three openings in the Nasal Mask:

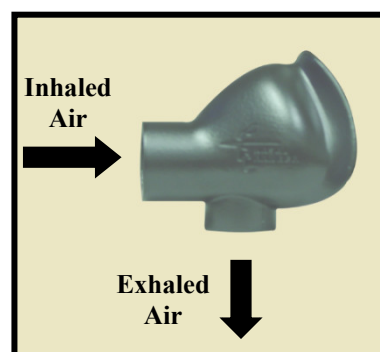
Nasal Port – Ergonomically designed to match the geometry of the human nose and face.

Inhalation Port – Opposite the nasal port, this port channels air into the mask from the Nasal Ranger® Field Olfactometer.

Exhalation Port – Located at the bottom of the mask, this port allows air exhaled through the nose to exit the mask.

Function of the Nasal Mask

A check valve is placed in both the inhalation and the exhalation ports in order to control the direction of airflow through the Nasal Mask while using the Nasal Ranger® Field Olfactometer. These check valves permit air to move in only one direction through the ports. When inhaling, only air that has passed through the Nasal Ranger® Field Olfactometer will enter the Nasal Mask, while ambient air will be prevented from entering the mask. Inversely, when exhaling, air will be ejected out the exhalation port and away from the user, disallowing it to travel back through the Nasal Ranger® Field Olfactometer.



Check valves are easily replaced if they become dirty or damaged. They are press fit into the ports and can be removed by hand by applying pressure to the outer rim of the valve from inside the Nasal Mask. To order additional check valve kits, contact St. Croix Sensory (see *Accessories*, page 16).

Nasal Mask Installation: To prevent kinking of the O-rings, rotate the Nasal Mask as you mount it to the Nasal Ranger® Field Olfactometer nozzle. This will aid in ensuring the longevity of the O-rings.

Cleaning: St. Croix Sensory recommends cleaning the Nasal Mask using the included disposable isopropyl alcohol wipes. To order additional wipes, contact St. Croix Sensory (see *Accessories*, page 16). Moist towelettes and other wipes purchased in stores should be avoided, as they often contain a fragrance that may leave a background odor on the Nasal Mask.

Care and Warnings: To ensure a long functional life of the Nasal Mask, adhere to the following warnings:

- The Nasal Mask is fragile. Do not drop on hard surfaces, as chipping and breakage could result.
- Do not attempt to clean in a dishwasher or autoclave, as these machines could damage the mask
- Do not expose to temperatures greater than 120°F, as these extremes could damage the mask.

NASAL MASK: INSTRUCTIONS FOR USE AND MAINTENANCE (CONTINUED)

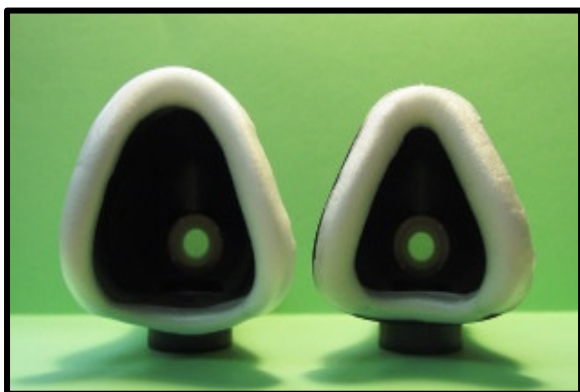
The Comfort Seal

The Comfort Seal is a disposable accessory designed to improve comfort and ensure proper sealing of the Nasal Mask during use of the Nasal Ranger® Field Olfactometer. Shaped to match the geometry of the Nasal Mask, the Comfort Seal is made of a medical-grade foam that has seen extensive use in skin contact applications.

Installation: The Comfort Seal has an adhesive on one side to adhere it to the Nasal Mask. To apply, simply peel off the paper backing and press the Comfort Seal firmly to the mask rim. Due to the variability of the shape of the nose between users, some may find better fitment by adjusting the positioning of the Comfort Seal on the rim of the Nasal Mask. The picture below on the left shows two examples on how to position the Comfort Seal.

Functional Verification: If applied and positioned correctly, the Comfort Seal should create an airtight seal around the face. To check, insert the included stopper into the inhale port of the Nasal Mask and attempt to breathe through the mask. If air leaks in around the Comfort Seal, try reapplying it with a different positioning.

Safety and Replacement: The Comfort Seal is designed to be used by one person only. To ensure it is odor free, the Comfort Seal should be cleaned with an isopropyl alcohol wipe at least daily and replaced at least weekly. Remove and dispose of the Comfort Seal when it becomes dirty, odorous, or if another person will be using the Nasal Mask. After removing the Comfort Seal, clean off the glue residue and wipe the Nasal Mask with an isopropyl alcohol wipe before applying a new one.



For those with wider noses, the installation on the left may be preferable, while people with narrower noses may favor the installation on the right.



When inhaling with the stopper in place, the Nasal Mask should form a vacuum seal around your nose.

ODOR FILTER CARTRIDGES:

INSTRUCTIONS FOR USE AND MAINTENANCE

The Nasal Ranger® Field Olfactometer uses replaceable odor filter cartridges that contain a proprietary blend of granular activated carbon multimedia which is designed to remove odors from the ambient air. The unique design of these odor filter cartridges allows easy replacement in a convenient package. There are four different carbon blends available, each suited to a particular environment.

Safety

The replaceable odor filter cartridges are **only** for use with the Nasal Ranger® Field Olfactometer manufactured by St. Croix Sensory, Inc. Do **not** attempt to use them with any over device.

Do **not** use these cartridges under the following conditions or scenarios:

1. As respirator cartridges for the reduction or elimination of hazardous chemicals in the air.
2. In atmospheres where contaminant concentrations are unknown, immediately dangerous to life and health, or exceed applicable local standards or U.S. Occupational Safety and Health Administration (OSHA) standards.
3. In atmospheres that contain less than 19.5% oxygen.

Failure to adhere to these protocols could result in injury or death. Only use these odor filter cartridges in the prescribed way with a Nasal Ranger® Field Olfactometer.

Replacement Instructions

St. Croix Sensory recommends replacing your odor filter cartridges after 200 hours of field use. If an odor is detected through a blank position, the odor filter cartridges must be replaced. Both must be replaced at the same time. They are mounted to the Nasal Ranger® Field Olfactometer using a standard threaded stud, and no tools are necessary to replace them.

To replace the odor filter cartridges:

1. Lay the Nasal Ranger® Field Olfactometer on its side on a flat, stable surface.
2. Remove the used cartridges from the Nasal Ranger® Field Olfactometer by unscrewing them counterclockwise. Dispose of the used cartridges.
3. Ensure the cartridge O-ring is correctly seated within its groove in the cartridge housing.
4. Remove a new cartridge from its packaging and place the threaded end onto the cartridge housing stud. Turn the cartridge clockwise until snug against the O-ring. **Tighten the cartridge hand-tight only. Do not use any tools to tighten the cartridge.**
5. Repeat for the other cartridge.

NOTE: If the cartridge does not spin freely, it may be cross threaded. Do not continue tighten it, as this could result in air leaks and will potentially damage the cartridge. Unscrew it fully before attempting to install it again.

ODOR FILTER CARTRIDGES: INSTRUCTIONS FOR USE AND MAINTENANCE (CONTINUED)

Cartridge Scheduling and Care

It is recommended to replace both cartridges in accordance with an established cartridge replacement schedule. To ensure consistent results of the instrument, the user may decide to replace the cartridges:

- Before each use of the Nasal Ranger® Field Olfactometer
- After so many uses of the Nasal Ranger® Field Olfactometer
- After so many hours of use of the Nasal Ranger® Field Olfactometer
- Or after some other convenient timeframe

Leave the odor filter cartridges in their factory packaging before they are used. Once the cartridge packages are opened, store them in a climate-controlled environment away from odors when not in use.

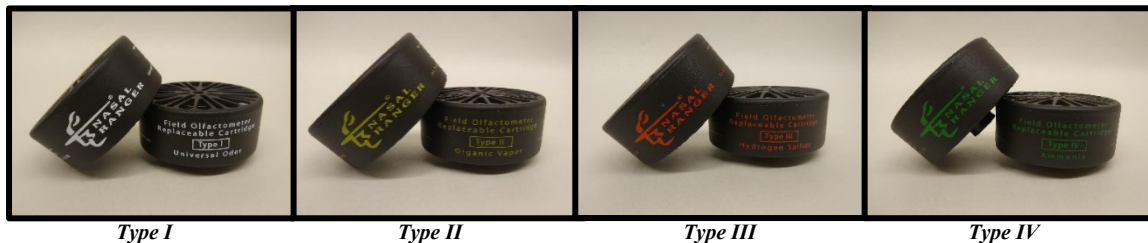
Note that some very strong odors may overpower the cartridges and will be detected through a blank position. In this situation, contact St. Croix Sensory for assistance.

Do not alter, misuse, or abuse the odor filter cartridges.

If you have any questions about the use, application, or maintenance of the Odor Filter Cartridges, contact St. Croix Sensory, Inc at 1-651-439-0177, or visit www.fivesenses.com/nasalranger.

Types of Cartridges

St. Croix Sensory manufactures four different types of odor filter cartridges, each suited to different odors and scenarios. Using certain cartridge types may yield extended longevity of the odor filter. Contact St. Croix Sensory for any questions regarding proper use of odor filter cartridge types.



Type I, Universal Odor – Suited for most environments, this odor filter cartridge will be useful to anyone using a Nasal Ranger® Field Olfactometer.

Type III, Hydrogen Sulfide – Suited for situations in which high amounts of H₂S will be present, such as wastewater treatment and oil processing plants.

Type II, Organic Vapor – Suited for situations in which high amounts of organic vapors will be present, such as petroleum industrial plants and agricultural complexes.

Type IV, Ammonia – Suited for situations in which high amounts of NH₃ will be present, such as livestock operations and manure processing.

TROUBLESHOOTING GUIDE

Problem	Possible Solutions
Unit doesn't power on or the LED doesn't light up.	<ul style="list-style-type: none"> Press the power button several times to clean off any corrosion on the electrical contacts. Ensure the battery is properly connected and is free from corrosion. Install a new battery.
Power only stays on for a short time.	<ul style="list-style-type: none"> Normal operation. The LED display will turn off after 45 seconds of inactivity, and the unit will fully power down after 5 minutes of inactivity. If the unit shuts down before this, it may be low on power. Install a new battery.
When inhaling, flow sensor LED display responding erratically or not responding at all.	<ul style="list-style-type: none"> Install a new battery. Ensure the Nasal Mask is properly sealing against the user's face. Try to reposition the mask or the Comfort Seal. Inspect the check valves to ensure they are properly positioned inside the mask ports and are clean of any loose debris. If damaged, check valves may need replacing.
An odor is detected while the D/T dial is set at a blank position.	<ul style="list-style-type: none"> Ensure the Nasal Mask is properly sealing against the user's face. Try to reposition the mask or the Comfort Seal. Inspect the check valves to ensure they are properly positioned inside the mask ports and are clean of any loose debris. If damaged, check valves may need replacing. Inspect the odor filter cartridges to ensure they are properly seated in the housing. Be sure they are threaded into the housing correctly and are snug against the O-rings (hand-tight only). The odor filter cartridges may need replacing. See page 13 for details. The ambient odor may be too strong or of a type that exceeds the design of the odor filter cartridges. Contact St. Croix Sensory for assistance.
The D/T dial does not turn.	<ul style="list-style-type: none"> Ensure the dial mounting screw is not too tight. If needed, loosen with a 3/32 hex head screwdriver. Ensure there is nothing impeding the movement of the dial. If needed, remove the dial to inspect and clean any debris present.
The D/T dial does not click into position or spins freely.	<ul style="list-style-type: none"> Ensure the dial mounting screw is not loose. If needed, tighten with a 3/32 hex head screwdriver. Ensure there is nothing impeding the movement of the dial. If needed, remove the dial to inspect and clean any debris present.

If any problem is not resolved with these suggested solutions, contact St. Croix Sensory for technical support at 1-651-439-0177, or send an email to stcroix@fivesenses.com.

ACCESSORIES

Part Number	Description
NR0009	9-Volt Battery
NR0011	Odor Sensitivity Test Kit
NR0020	O-Ring, Mask Connection (2 Pairs)
NR0021	O-Ring, Odor Filter Cartridge (1 Pair)
NR0043	Check Valve Kit (Parts for Inhalation and Exhalation Ports)
NR0046	Nasal Ranger® Mask Package (Nasal Mask, Comfort Seal Package, and one Access Code for the Nasal Ranger® Online Training Course)
NR0054	High Dial Assembly (D/T Ratios 60, 100, 200, 300, 400, 500)
NR0062	Comfort Seal Package (10 Pack)
NR0063	Isopropyl Alcohol Cleaning Wipes Package (10 Pack)
NR0081	Type I Universal Odor Filter Cartridge (1 Pair)
NR0082	Type II Organic Vapor Odor Filter Cartridges (1 Pair)
NR0083	Type III Hydrogen Sulfide Odor Filter Cartridges (1 Pair)
NR0084	Type IV Ammonia Odor Filter Cartridge (1 Pair)
NR0091	Type I Universal Odor Filter Cartridge (6 Pairs)
NR0092	Type II Organic Vapor Odor Filter Cartridge (6 Pairs)
NR0093	Type III Hydrogen Sulfide Odor Filter Cartridge (6 Pairs)
NR0094	Type IV Ammonia Odor Filter Cartridge (6 Pairs)

For pricing and availability, including for accessories and parts not listed above, contact St. Croix Sensory at 1-651-439-0177, or send an email to stcroix@fivesenses.com.

TECHNICAL SPECIFICATIONS

Detection Technique:	Human Nose
Discrete Dilution Ratios (Standard Dial, D/T):	2, 4, 7, 15, 30, 60
Response Time:	As Fast as 3 Seconds (2 Inhalations)
Accuracy:	+/- 10% of D/T Ratio
Repeatability:	+/- 2%
Inhalation Rate:	16 - 20 Liters Per Minute
Operating Temperature Range:	-10° to 160°F (-23° to 71°C)
Power Requirements:	9-Volt Alkaline Battery
Nasal Ranger® Field Olfactometer Dimensions:	14" x 7.5" x 4" (35.5 cm x 19 cm x 10 cm)
Weight:	2.0 lbs (0.91 kg)
Materials of Construction:	PTFE and Polymer Alloys
Odor Filter Cartridge Dimensions:	3.5" Diameter x 1.5" Height (8.9 cm x 3.8 cm)
Nasal Mask Dimensions:	2.75" x 2.75" x 2.25" (7 cm x 7 cm x 5.7 cm)
U.S. Patent Number:	6,595,037
Calibration Verification:	Recommended Annually
EMC Verification:	Emissions: EN 61326:1997, Class B Immunity: EN 61326:1997, Industrial Location
Markings:	89/336/EEC (EMC) 92/59/EEC (General Product Safety)



SALES TERMS AND CONDITIONS

BY ST. CROIX SENSORY

Offer and Acceptance:

This document is an offer to enter into an agreement. For an effective agreement to be reached a duly authorized agent of Purchaser must accept all of the terms and conditions set forth below, none of which can be altered or amended without St. Croix Sensory's prior written agreement.

Quotations and Prices:

The price stated on a St. Croix Sensory quotation form is firm for the initial order for a Nasal Ranger® Field Olfactometer or related product only. Prices are subject to change without notice and orders calling for future delivery will be billed according to the price in effect at the time of delivery. Oral quotations will not be honored by St. Croix Sensory and written quotations will automatically expire sixty (60) calendar days from the date issued and are subject to earlier termination by written notice. All prices are FOB, St. Croix Sensory's manufacturing facility.

Payment Terms:

The net amount of each invoice is due in full with the order, by credit card payment or other method acceptable to St. Croix Sensory.

Taxes:

All present or future sales, use, revenue, excise or other taxes applicable to the Nasal Ranger® Field Olfactometer or related products which are the subject of this Agreement shall be added to the purchase price and shall be paid by Purchaser, unless Purchaser provides St. Croix Sensory with a tax exemption certificate acceptable to the relevant taxing authorities.

Shipment:

Both the method and the route of shipment are at the discretion of St. Croix Sensory, unless Purchaser supplies explicit instructions to the contrary. All insured shipments will be made at Purchaser's expense. Identification of the particular Nasal Ranger® Field Olfactometer or related products to this agreement and the risk of loss will pass to Purchaser at the time of delivery to the carrier.

Governing Law and Venue:

This agreement shall be governed by and construed under and in accordance with the laws of the State of Minnesota, United States of America (without regard to conflicts of laws principles). The venue of any legal action arising out of this agreement shall be the Federal or State Courts located in Hennepin or Ramsey County in Minnesota, U.S.A., and the parties consent to the jurisdiction of these courts.

Nasal Ranger® Field Olfactometer Limited Warranty:

St. Croix Sensory warrants to Purchaser that in normal and contemplated use and service, the Nasal Ranger® Field Olfactometer purchased from St. Croix Sensory will be free from defects in material or workmanship for a period ending 365 days from the date of original shipment by St. Croix Sensory. Subject to the conditions and exclusions contained in this document, St. Croix Sensory will, at its option, either repair or replace any defective Nasal Ranger® Field Olfactometer or part thereof or refund the purchase price of the defective Nasal Ranger® Field Olfactometer. Parts, devices or equipment that are supplied by vendors other than St. Croix Sensory, shall carry only the applicable warranties and limitations provided by the relevant vendor. Expendable and/or consumable items or parts included or used in connection with the Nasal Ranger® Field Olfactometer are not covered under this limited warranty. This limited warranty does not cover a Nasal Ranger® Field Olfactometer that has been misused, altered, disassembled, neglected, handled carelessly, or used for purposes other than its intended purpose. This limited warranty also does not cover loss or damage resulting from any casualty loss or from unauthorized use or service. Under no circumstances shall St. Croix Sensory be liable for consequential or other damages, losses, or expenses in connection with or by reason of the use or inability to use the Nasal Ranger® Field Olfactometer for any purpose. **WARNING:** Unscrewing and disassembling the Nasal Ranger® Field Olfactometer housing will break and alter the pressure seal of the instrument (6 screws visible on the left-side housing and 2 under the battery door). Doing so will void the limited warranty and require the instrument to be shipped back to St. Croix Sensory to be re-sealed and re-calibrated at Purchaser's expense.

Warranty Service Procedures:

If a defect should appear during the warranty period, Purchaser should return the defective Nasal Ranger® Field Olfactometer, freight and insurance prepaid, if possible in the original shipping container, to such address as shall be specified from time to time by St. Croix Sensory. The appropriate warranty service address may be determined by calling 1-800-879-9231 or 1-651-439-0177 or by consulting www.fivesenses.com. Any returned Nasal Ranger® Field Olfactometer must be accompanied by a written statement including: the name of Purchaser; a description of the problem(s); and the action desired. St. Croix Sensory shall not be responsible for any loss or damage incurred in shipping. Any warranty work to be performed by St. Croix Sensory shall be subject to St. Croix Sensory's confirmation that the returned Nasal Ranger® Field Olfactometer meets St. Croix Sensory's warranty requirements. If a defect is covered by this limited warranty, the repaired or replaced Nasal Ranger® Field Olfactometer will be returned to Purchaser at St. Croix Sensory's cost. Following a warranty repair or replacement, this limited warranty shall continue in effect until the end of the original warranty period or for sixty (60) days after the repair or replacement, whichever is later.

SALES TERMS AND CONDITIONS

BY ST. CROIX SENSORY

(CONTINUED)

Related Product Limited Warranty:

St. Croix Sensory warrants to Purchaser that in normal and contemplated use and service any product related to the Nasal Ranger® Field Olfactometer purchased by Purchaser ("related products" includes components, consumables and similar items such as odor-filter cartridges, Nasal Masks, check valves, carrying straps, and carrying case) shall be free from defects in material or workmanship for a period ending (i) 90 days from the date of original shipment by St. Croix Sensory, or (ii) upon expiration of the time specified with respect to a particular product, as applicable. Subject to the conditions and exclusions in this document, St. Croix Sensory will, at its option, repair or replace any related product that is defective, or refund the purchase price. Under no circumstances shall St. Croix Sensory be liable for consequential or other damages, losses, or expenses in connection with or by reason of the use or inability to use a related product purchased for any purpose.

Exclusion of Warranty of Fitness for any Purpose:

St. Croix Sensory makes no warranty as to the suitability or fitness of any of its equipment or products, including specifically the Nasal Ranger® Field Olfactometer, for any particular purpose specific to the Purchaser. The Purchaser is solely responsible for the selection, use, efficiency, fitness and suitability of St. Croix Sensory's equipment and products. The Purchaser assumes all risks and liabilities in connection with the use of St. Croix Sensory's equipment and products, including specifically the Nasal Ranger® Field Olfactometer.

Exclusion of Liability for Consequential and Similar Damages:

In no event shall St. Croix Sensory be liable to Purchaser for any indirect, special or consequential damages or lost profits arising out of or relating to the Nasal Ranger® Field Olfactometer or related products, or their performance or non-performance, even if St. Croix Sensory has been advised of this possibility.

Limitation to Amounts Paid:

St. Croix Sensory's liability, if any, to Purchaser or to the customers of Purchaser or any other person under this limited warranty shall in no event exceed the total amount paid to St. Croix Sensory by the Purchaser for a defective or non-conforming Nasal Ranger® Field Olfactometer or related product.

THE LIMITED WARRANTY AND REMEDIES SET FORTH IN THIS DOCUMENT ARE THE SOLE AND EXCLUSIVE REMEDIES AVAILABLE TO ANY PERSON FOR ANY DAMAGES OF ANY KIND AND NATURE, INCLUDING INCIDENTAL, CONSEQUENTIAL OR SPECIAL, RELATED TO THE NASAL RANGER® FIELD OLFACTOMETER OR RELATED PRODUCTS, WHETHER ARISING FROM WARRANTY, CONTRACT, NEGLIGENCE, TORT OR OTHERWISE. ST. CROIX SENSORY SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER IMPLIED WARRANTY. NO WAIVER, ALTERATION, OR MODIFICATION OF THE FOREGOING CONDITIONS SHALL BE VALID UNLESS MADE IN WRITING AND SIGNED BY AN EXECUTIVE OFFICER OF ST. CROIX SENSORY.

In the event any implied warranties (including, but not limited to the implied warranties of merchantability or fitness for a particular purpose) are found to exist, such warranties are limited (i) in duration to the period of the limited warranties set forth in this document, and (ii) in amount to the total amount paid to St. Croix Sensory by the Purchaser for the Nasal Ranger® Field Olfactometer or related product in question. (Some States do not permit the exclusion of incidental or consequential damages, and in those States the foregoing limitation may not apply. The limited warranties as set forth in this document give the Purchaser specific legal rights, and the Purchaser may have other legal rights which vary from State to State.)

ODOR DESCRIPTOR EXAMPLES

These examples descriptors can be used when marking down the individual characteristics of odors while operating the Nasal Ranger® Field Olfactometer. Note that odors are complex and have a very wide range of possible descriptors, and thus this list is non-exhaustive and is provided as example only. Additional descriptors can be added to this list as the user sees fit.

100's – Floral

Almond - 101
Cinnamon - 102
Coconut - 103
Eucalyptus - 104
Fragrant - 105
Herbal - 106
Lavender - 107
Licorice - 108
Marigold - 109
Perfume - 110
Rose - 111
Spice - 112
Vanilla - 113

200's – Fruity

Apple - 201
Cherry - 202
Citrus - 203
Cloves - 204
Grapes - 205
Lemon - 206
Maple - 207
Melon - 208
Mint - 209
Orange - 210
Strawberry - 211
Molasses - 212

300's – Vegetable

Celery - 301
Corn - 302
Cucumber - 303
Dill - 304
Garlic - 305
Green Pepper - 306
Nutty - 307
Potato - 308
Tomato - 309
Onion - 310

400's – Earthy

Ashes - 401
Burnt Wood - 402
Chalk - 403
Coffee - 404
Grain Silage - 405
Grass - 406
Mold - 407
Mushroom - 408
Musty - 409
Peat - 410
Pine - 411
Smoke - 412
Stale - 413
Swamp - 414
Woody - 415
Yeast - 416

500's – Offensive

Blood - 501
Burnt - 502
Burnt Rubber - 503
Decay - 504
Fecal - 505
Garbage - 506
Landfill Leachate - 507
Manure - 508
Mercaptan - 509
Putrid - 510
Rancid - 511
Raw Meat - 512
Rotten Eggs - 513
Septic - 514
Sewer - 515
Sour - 516
Spoiled Milk - 517
Urine - 518
Vomit - 519

600's – Fishy

Amine - 601
Dead fish - 602
Perm Solution - 603
Seashore - 604
Saltwater - 605

700's – Chemical

Burnt Plastic - 701
Car Exhaust - 702
Cleaning Fluid - 703
Coal - 704
Creosote - 705
Diesel - 706
Gasoline - 707
Grease - 708
Foundry - 709
Kerosene - 710
Chlorine - 711
Mothball - 712
Oil - 713
Paint - 714
Petroleum - 715
Plastic - 716
Resin - 717
Rubber - 718
Solvent - 719
Styrene - 720
Sulfur - 721
Asphalt - 722
Turpentine - 723
Varnish - 724
Vinegar - 725
Vinyl - 726

800's – Medicinal

Alcohol - 801
Camphor - 802
Anesthetic - 803
Plastic - 804
Rubber - 805
Disinfectant - 806
Menthol - 807
Soap - 808

ODOR MONITORING DATA SHEET

Odor Monitoring Site: _____ **Date:** _____

Cloud Conditions: _____ **Temperature:** _____ **Precipitation:** _____

Wind Direction and Speed: _____ **Relative Humidity:** _____ **Barometric Pressure:** _____

Notes: _____

[illegible]

REGISTRATION FORM

Thank you for purchasing the Nasal Ranger® Field Olfactometer! To help us serve you better, please complete this form and either email, fax, or mail a copy to St. Croix Sensory, Inc.

Email: stcroix@fivesenses.com

Fax: +1 651-439-1065

**Mail: 1150 Stillwater Blvd N
Stillwater, MN 55082, USA**

Contact Information

First Name: _____ Last Name: _____

Affiliation: _____

Mailing Address: _____

City: _____ State/Province: _____

Postal Code: _____ Country: _____

Phone: _____ Alt. Phone: _____

Fax: _____ Email Address: _____

Purchase Details

Serial Number: _____ Date Purchased: _____

(Located on back side of battery compartment door)

Where did you purchase the Nasal Ranger? _____

What is your primary use for the Nasal Ranger? _____

Additional Comments, Questions, or Concerns

