The NightWatch Bedbug Monitor
Operating Instructions

Read Before Unpacking and Operating
The NightWatch Bedbug Monitor

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Revision 01

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Thank You!

Your NightWatch Bedbug Monitor is enclosed.

In military units, the responsibility of the Night Watch is to remain alert to guard against enemy attack while the unit sleeps, and to sound the alarm when an attack comes. In professional pest control, the NightWatch stands guard against bedbug attack, so you can protect those who depend on you to keep them safe.

Please carefully read these instructions. They tell you how to unpack setup and operate the unit, and how to ship it to another location.

Safety

IMPORTANT INSTRUCTIONS

Read and follow the following safety precautions before using the unit.

1. Use only in a well ventilated room.
2. Use only with transformer provided, model number DYS40-240133W.
3. Do not operate this unit with a damaged cord or plug, or after the unit malfunctions, or has been dropped or damaged in any manner. Return unit to authorized service facility for examination, electrical or mechanical adjustment, or repair
4. Do not use an extension cord with this unit.
5. Do not install or use this unit within 10 feet of a pool.
6. This unit is intended to be correctly orientated in a vertical position.
7. Periodically remove bedbugs from the collection pit falls. Do not allow the collection pit falls to become full.
8. Visually inspect the unit for bedbugs and remove them before moving it from one location to another.
9. Replace the bedbug lure and CO_2 bottle as a pair when indicated by the signal on unit.
10. Read and follow instructions affixed to the CO2 bottle.
11. CO2 bottle must be filled only by properly trained personnel in accordance with CGA Pamphlets P-1, C-6, G-6, and AV-7 available from the Compressed Gas Association, 4221 Welney Road, Chantilly, VA 20151-2923, USA
12. Do not expose the CO2 bottle to temperatures above 130° F (54° C) when pressurized, including inside a confined or unventilated space
13. Do not tamper with or change the CO2 bottle, valve or burst disk.
14. Do not leave or store the CO2 bottle in a confined or unventilated space, such as an enclosed vehicle.
15. CO2 bottle must be destroyed if exposed to fire or heated to a temperature exceeding 350° F (177° C)

SAVE THESE INSTRUCTIONS – This manual contains important safety and operating instructions for this unit.

Bedbug Physiology

To understand how the NightWatch works and how to use it effectively, it is useful to first understand key details of bedbug physiology. Bedbugs have a great sense of smell. They can smell you from across the room, even if they cannot see you. Bedbugs also have sensitive thermal sensors on the tips of their antennae. Like mosquitoes, bedbugs use these thermal sensors to find places to bite where the blood supply comes closest to the surface of the skin.

All bedbugs go through 5 immature stages between an egg and adulthood. Immature bedbugs are called nymphs. To go from one stage to another, the immature bedbug must take a blood meal. Then, in 7 to 10 days, depending on temperature and humidity, the nymph molts, shedding its exoskeleton and emerging in a larger, more mature stage of development. This process is repeated until the bedbug is an adult.

Adult bedbugs often take blood meals every 7 to 10 days or less, depending on temperature and humidity.

Because bedbugs feed sporadically, continuous monitoring for a minimum of one week and preferably for two weeks is necessary to detect new or light infestations. New infestations may result from “hitch hikers” carried in travelers’ luggage, or foraging bedbugs from an adjacent unoccupied apartment seeking a replacement blood-host. Light infestations are those in which a few, newly arrived bedbugs have begun to feed, but have not yet reproduced in large numbers.

In between blood meals bedbugs congregate in refuges which they mark with an aggregation pheromone. Bedbugs return to the refuge between blood meals. Refuges provide shelter and mating opportunities, and a place to lay eggs. Females lay up to 200 eggs in their lifetime, so populations expand rapidly if both food and shelter are available.

When a dwelling is no longer occupied, bedbugs can go without blood meals for extended periods of time, again depending on temperature and humidity. Bedbugs begin to forage for blood meals if they have not fed in two weeks. In a multi family dwelling, they may move from one apartment to another, for example.

Bedbugs have been known to survive for two to six months without a blood meal. Survival is extended in high humidity, and shortened in low humidity. Unfed bedbugs are not active in the absence of a blood-host, but quickly reactivate in the presence of a blood-host, making it necessary to monitor for several days in an unoccupied, but previously infested dwelling.

How NightWatch Monitors Bedbug Host-seeking Activity

1. Because bedbugs are nocturnal and most active in the early hours of the morning, the NightWatch remains off until 10 PM, when it is activated by its microprocessor control. It remains active throughout the night and into the morning when bedbugs are most active, until the microprocessor turns the unit off at 6 AM. Because bedbugs take several minutes to feed, they have the most success when you are lying still and in deep sleep.
2. CO_2 is released every 5 seconds simulating the "breath" of a 70 pound (32 kg) child. CO_2 is the most powerful attractant for bedbugs. The NightWatch monitors the amount of CO_2 remaining in the bottle and lets you know when the bottle is low by flashing a low CO_2 warning.
3. The thermal lure heats up, producing the infrared image of blood near the surface of the skin and the body temperature of a small animal. The NightWatch has a higher "skin" temperature than a human by design. It is more easily detected by bedbugs, yet is as attractive as human skin temperature. As one entomologist aptly described it, "To a bedbug the NightWatch looks like a shaved rabbit!"
4. Natural host-odor attractants are activated by the heat of the thermal lure, and evaporate into the CO_2 plume. In scientific terminology host odor attractants are called kairomones. Bedbugs respond to kairomones such as CO_2 and emanations given off by human breath and skin. BioSensory bedbug lures use several kairomones to which bedbugs are known to respond.
5. Bedbugs follow the CO_2 and host odor plume until they detect the thermal lure. Bedbugs have body heat sensors on the tip of their antennae just like mosquitoes Because their mouthparts cannot reach the blood supply except where it is close to the skin, and because these areas of the body are slightly warmer than other areas, insects use heat sensors to pick the best place to bite.
6. Bedbugs attempting to reach the thermal lure climb up the felt covered ramp of the pit fall traps that are located on either sided of the NightWatch. When they get to the top of the pit fall, they encounter a patent pending "slippery slope" surface which is level at first, but then quickly falls away into the pit. By the time the bedbugs try to turn around, it's too late. They are past the point of no return and fall into a pit with smooth vertical sides from which they cannot escape. Once inside the pit fall, they become comfortable. It's warm, and as other bedbugs arrive their propensity for aggregation in a refuge kicks in. The gently warmth slowly desiccates them (dries them out) overnight.

Features and Benefits

Effectiveness

In tests reported by the Royal Entomological Society, a NightWatch prototype captured adult bedbugs and immature bedbugs in all 5 nymph stages. NightWatch was effective with and without a sleeping human in the room. What are some keys to its effectiveness?

- Pure, bottled CO_2 mimics breath exactly.
- Because CO_2 is released in pulses every 5 seconds, the timing of the CO_2 emanations faithfully mimics a living thing, which bedbugs are programmed to track from one "breath" to the next.
- The thermal lure faithfully reproduces the infrared image of blood near the skin – not the artificial, uniform heat of a heating element, but the mottled heat signature of a living thing. To a bedbug, the NightWatch looks like a shaved rabbit!
- It is one thing to use CO_2 or kairomones to attract bedbugs, but if they are not captured the infestation goes unrecognized and untreated. Light infestations, while the most easily controllable, are also the most difficult to verify. Bedbugs avoid sticky traps. Flooding a room with CO_2 saturates their sensors. The journal of the Royal Entomological Society documents a NightWatch prototype's ability to capture both adult bedbugs and all stages of nymph in both field and laboratory trials. In field trials of both light and heavy infestations, the NightWatch prototype again captured both immature nymphs of every stage as well as adult bedbugs, and did so with and without a human host in the room.
- In the most dramatic field trial, the NightWatch prototype captured 10,000 bedbugs from a single apartment! Daily collections fell from hundreds to single digits in three weeks. Previously, this apartment had been treated three times with residual pesticide and the furniture received steam treatment. No other monitor is as effective against bedbugs as NightWatch.

Quality, Durability and Dependability

Dragonfly mosquito trap technology, predecessor to the NightWatch, has been in service for 8 years around hospitals, hotels and commercial establishments. Like its predecessor, the NightWatch is built with industrial quality components for durability and dependability. For example:

- The CO_2 release valve is rated for millions of cycles.
- Solid state electronics are used for the microprocessor circuit board, control panel and thermal lure.

- Structural elements are steel and heavy ABS plastic.

Convenience, Economy and Productivity

- The NightWatch is a "good neighbor" bedbug trap because it does not transport bedbugs from an infested location to one that is not. The electronic control module is sealed, so bedbugs cannot enter. The entire underside of the unit has no hidden surfaces to allow hitch hiking bedbugs to hide from view.
- The pit falls detach in seconds. There is no guessing about infestation.
- Non-technical personnel can be trained to use the NightWatch in minutes.
- Refilling the NightWatch takes less than 5 minutes, and monitoring costs about $2 per day.
- A 16 ounce CO_2 bottle lasts a week, as does the BioSensory Bedbug Lure.
- NightWatch extends the number of rooms than can be accurately monitored per employee
- NightWatch improves the accuracy with which infestations, especially light infestations, are detected
- NightWatch definitively measures the effectiveness of treatments for local departments of health, landlords, tenants and Professional Pest Control providers
- NightWatch mitigates risk of litigation and indicates best efforts control of bedbugs for landlords, hotel operators, dormitories, and Professional Pest Control service providers.

Environment

- The NightWatch is carbon neutral. The CO_2 used is recycled from the atmosphere.
- The NightWatch attracts and kills only biting insects seeking a blood meal. It is harmless to beneficial insects.
- Monitoring with the NightWatch requires no insecticides.
- The NightWatch will not transport bedbugs from one location to another.

Assembling the NightWatch Bedbug Monitor

Open the container and remove the foam inserts. Store the container and foam inserts in the event you need to ship the NightWatch Bedbug Monitor elsewhere.

Note: NightWatch Bedbug Monitor requires a 16 ounce to 32 ounce CO_2 bottle that may be purchased at any Wal★Mart™, Lowe's™, or Dick's™ sporting goods or store.

Insert CO_2 bottle. See Figure 1. Tighten the CO_2 by hand only!

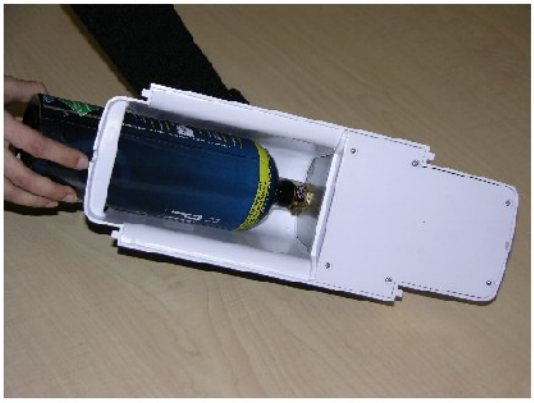

Figure 1 Insert CO_2 bottle

The CO_2 bottle and CO_2 release valve in the NightWatch conform to Compressed Gas Association standards. As the bottle is threaded into the valve, an 'O' ring on the CO_2 bottle engages a sealing diameter on the NightWach valve. This 'O' ring engagement prevents CO_2 leaks. When the bottle is fully threaded into the valve, it seats against a pin which opens the bottle and pressurizes the CO_2 release system. Full CO_2 bottles have high internal pressure and are more difficult to thread in or out, and emit an audible hiss when they are removed. Empty CO2 bottles thread easily in or out. Take care not to damage the 'O' ring on CO2 bottles. Hand tighten the CO2 bottle. Never use a tool to insert or remove the Co2 bottle.

Attach the pit falls to the housing. See Figure 2.

Figure 2 Attach pit falls to housing

Assemble the low voltage power cord. See Figure 3. Plug the power cord into the low voltage transformer.

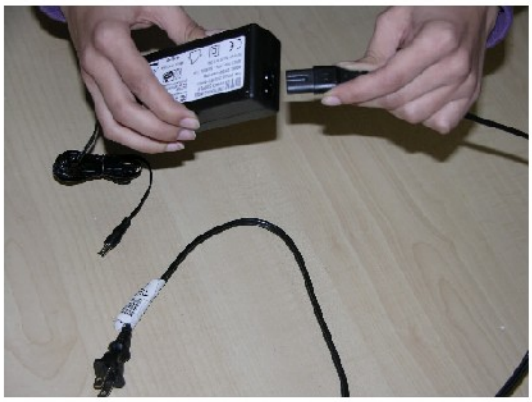

Figure 3 Assemble power cord to low voltage transformer

Attach the low voltage power cord to the NightWatch. See Figure 4.

Figure 4 Attach low voltage power cord

Attach lure and lure cover. See Figure 5.

To open the BioSensory Bedbug Lure, first remove it from its packaging and then remove the adhesive cover sealing the lure orifice. The patent-pending lure housing and kairomone emission system is designed to provide optimal levels of attractants throughout a week of monitoring.

Place the kairomone lure on the top of the NightWatch such that it rests on the thermal lure. The kairomone lure attaches to a mounting pin, and the concave bottom of the kairomone lure housing maximizes heat transfer from the thermal lure. Heat from the thermal lure activates kairomone release. Kairomones are released through the orifice at the top of the kairomone lure.

Place the vented cover over the kairomone lure and CO_2 discharge tube. The vented cover allows kairomones to mix with CO_2 from the discharge tube, and be carried away by thermal eddy currents generated by the thermal lure. Normal air movement in the room disperses this life-like mixture of attractants, drawing bedbugs from their refuge.

Figure 5 Attach kairomone lure and vented cover

Programming the NightWatch Bedbug Monitor

To program the NightWatch Bedbug Monitor, simply enter the time of day. Depress the Time Set button to advance the Minutes. Depress and hold the time set button to switch to Hours. Depress the Time Set button to advance the Hours. Take care to correctly enter AM or PM. The PM indicator light illuminates for PM hours. See Figure 6.

The NightWatch will now activate between the hours of 10 PM and 6 AM. Bedbugs forage in low light conditions, so the NightWatch emits little light, and then in the red portion of the spectrum. The NightWatch display is red LEDs (Light Emitting Diodes). The LEDs are fully illuminated when the time is being set, but then go off to minimize light emissions. An LED flashes every 4 seconds to let you know that the NightWatch is operating properly.

In the event of a power outage, the time of day must be reentered.

Figure 6 Set the time

Press the Time Set switch to advance the minutes. Press and hold the Time Set switch to advance the hours. Note that PM hours are indicated in the upper left of the display. To minimize light emissions, the display will go dark after 60 seconds. A flashing LED will signal that the NightWatch is operating properly.

In addition to setting the time, the display is used to signal normal operation and other conditions. See Table 1 .

Condition	Display
Normal Operation	Time displayed 60 seconds, then LEDs flash every 4 seconds during normal operation
Low CO_2	CO2 displayed
Low Temperature ≤55° F	Lt displayed

Table 1 Status and warning indicators

To clear the Low CO_2 indicator, replace the empty CO_2 bottle with a full one.

CO_2 bottles are available in 16, 20, 24 and 32 ounce sizes. The life of various size bottles appears in Table 2. Note: CO_2 bottles are often filled to less than their capacity.

Liquid CO_2 (ounces)			
16	20	24	32
5 days	6 days	7 days	10 days

Table 2 CO2 Bottle Life

Placement of the NightWatch

In unoccupied dwellings, place the NightWatch in the bedrooms and sitting rooms.

In furnished bedrooms, place the NightWatch near the headboard of the bed. In unfurnished rooms, place the NightWatch where beds were previously located. Refuges for bedbugs are most likely to be near the headboard of the bed in bedrooms.

Sitting rooms must also be monitored for bedbugs, especially if a bedbug infestation has been found in any bedroom. In sitting rooms refuges for bedbugs are most likely to be near the location of sofas, reclining chairs, etc.

In occupied dwellings, place the NightWatch by the headboard of the bed.

Note: the NightWatch cannot protect a sleeping person from bedbug bites.

Persons sleeping in a room that has a suspected or confirmed infestation must:

1. Treat the bed, box springs and mattress to remove bedbugs using accepted methods such as mattress encasements, and/or treatments to kill bedbugs such as steam, CO_2 snow, or insecticides, and
2. Isolate the bed from access by bedbugs.
    a. This requires barriers to prevent bedbugs from climbing the bedposts (like placing the bedpost in a tin can filled with mineral oil used in the days of your great grandparents), and

b. Preventing any other access by bedbugs to the bed from adjacent walls, nightstands, etc., and
c. Preventing access by bedbugs to the bed from bed linens touching the floor, etc, and
d. Preventing access by bedbugs to the bed by transfer from clothing, hitching a ride to the bed from pajamas in a near by dresser, for example.

Exchanging CO_2 Bottles

Empty CO_2 bottles purchased at any Wal★Mart™, Lowe's™ or Dick's™ sporting goods store may be returned at the same location. Some locations fill empty bottles, but most locations exchange full bottles for empty ones.

Shipping the NightWatch Bedbug Monitor

To ship the NightWatch Bedbug Monitor:

1. Replace the foam inserts in the shipping carton,
2. Disassemble the NightWatch Bedbug Monitor, place it in shipping carton, and
3. seal the shipping carton securely.