NEW STANDARD Miniature Light Traps — Models 1012 &1212

for traps with and without the CO_2 Delivery System option

Instructions

Background on light trapping mosquitoes [1]

Experience has shown that light traps are an efficient and productive means of collecting mosquitoes, both in consideration of the numbers of individuals captured and the diversity of species represented. The **Models 1012 and 1212** represent the culmination of more than 25 years of insect trap design and manufacturing by the John W. Hock Company. The trap was designed for research, mosquito abatement operations, and pathogen survey purposes. We have attempted to produce an efficient, convenient, and durable trap through the use of the highest quality materials available and thoughtful design. The following instructions, suggestions, and references should enable you to make full use of your light trap.

Adult surveys are most frequently conducted because adult mosquitoes are easier to locate and identify than are the larvae. The surveys indicate the various species present and their relative abundance. Additional information obtained from light traps useful to mosquito control personnel allow: (1) determining and documenting the need for a control program, (2) assessing the best times and places to use space spray equipment, (3) determining if a disease potential exists, and (4) evaluation of control measures previously applied. Light trap data are also a source of reports to supervisors and the public concerning the extent of the problem and results of control operations. A seldom appreciated advantage of light trap collections is that males are also taken; because males emerge first, in some instances, their presence in collections is a useful indicator that a new brood is forthcoming. Light traps are also useful to arbovirus survey workers, for example, a principal vector of Western Equine Encephalitis, *Culex tarsalis*, as well as other vector species, can be collected in large numbers by our traps that employ incandescent light sources.

Proper location of light traps is particularly important. In general, the best catches are made where cover is good and the humidity is relatively high. Locations a short distance into the margins of wooded areas and swamps are very desirable; traps over open water or in open pasture are typically less productive. Traps should be suspended 5-6 feet above the ground, preferably 30 feet or more from buildings. To be avoided are areas near other sources of artificial light, sites exposed to strong winds, places near buildings housing animals, or those areas exposed to industrial fumes and smoke. For mosquito control operations, one or more traps should be located between known breeding sources and inhabited areas; others are best located in critical spots such as near residential and recreational sites. A single trap usually reflects mosquito flight activity within a few yards of its location. A trap may represent an area as large as a block, but this information is not always reliable, and a sufficient number of traps must be uti-

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1. The account here is very brief. Some excellent web sites offering trapping information are the following:

American Mosquito Control Association— http://www.mosquito.org/, Armed Forces Pest Management Board— http://www.afpmb.org/,

Florida Medical Entomology Laboratory— http://fmel.ifas.ufl.edu/, Iowa State Entomology Index: Medical Entomology— http://www.ent.iastate.edu/list/medical_entomology.html,

New Jersey Mosquito Biology and Control— http://www-rci.rutgers.edu/~insects/njmos.htm, US Army Center for Health Promotion and Prevention Medicine— http://chppm-www.apgea.army.mil/ento/,

USDA's Center for Medical, Agriculture, & Veterinary Entomology— http://cmave.usda.ufl.edu/~mosqfly/

lized to assure a representative sample. The actual number required will depend upon a number of factors including the degree of accuracy required, the manpower available, size of area involved, etc.

If a site fails to produce the expected number of mosquitoes, judging from collections in other traps in the area, the trap is relocated. Sometimes a shift of only a few yards makes a considerable difference in the number of mosquitoes attracted. If arbovirus survey work is being done where live catches are essential, care is taken to place the traps where they will be shaded from the morning sun.

Light traps are operated on a regularly scheduled basis of 1 to 7 nights per week; 4 nights' collection will usually give as valid an index as 7 nights per week. Therefore, trap collections should be made on 4 consecutive nights, such as Monday through Thursday of each week. Light trap collections of many species tend to fluctuate on a 4-week cycle corresponding with the phases of the moon. The best catches are usually made during the dark of the moon or on overcast nights. Rainfall during the night generally does not reduce the catch; in fact, intermittent showers appear to enhance the catch somewhat.

Studies have shown that release of CO_2 near the trap substantially increases the number and diversity of species of mosquitoes caught and makes trap placement less restricted as to placement and moonlight conditions. We provide three methods of CO_2 release. The low initial cost of an option available with either model, the ***Insulated Dry-Ice Container*** *(P/N 1.10*), makes using dry ice attractive. You can purchase this item after your traps if you later decide to add CO_2 to your surveillance program. The second method of CO_2 delivery is to order your Model 1012 or 1212 with the ***Photoswitch-Controlled CO_2 release option for the Model 1012 trap*** *(P/N 1.15)* or return your traps to us for a retrofit. A third way to add CO_2 to your trapping efforts are to employ the ***Granular Media CO2 Sachets*** *(P/N 1.25);* a single sachet is used with a trap each night. See web for more details on any of these options.

Operational Details

Electrical

- The **Incandescent Model 1012**, requires 0.50 Amps per hour to operate at 6.0-6.3 volts DC using the standard CM-44 bulb; using the CM-47 bulb which puts out about 40% less light requires 0.40 Amps. Four D-size flashlight batteries (preferably alkaline) in series will provide power for 1 night's operation (see ***4 D-Cell Battery Holder****, P/N 1.50* on our website); however, gel-cell lead-acid, 6 volt batteries which provide many nights' worth of power on one charge are probably the most common power source. These gel-cell lead-acid batteries do not leak and do not require the care in charging that NiCad batteries do. You can estimate the maximum run time for a fully-charged and new battery by dividing the AmpHr rating of the battery by the consumption of the trap (ca. 0.40 Amps/Hr); older batteries, even though fully charged will provide progressively less time. A 6 volt battery capacity of 10 AmpHrs (our *PN 2.30*) is a good size for this trap.
- The **Blacklight (UV) Model 1212**, requires 0.86 Amps per hour to operate at 6.0-6.3 volts DC using the F4T5 BLB (blue-blacklight) bulb. The standard 6 volt battery (*PN 2.30*) will run this trap for a single night's collection if one of the energy-saving programs are used to shut the light circuitry off during daylight hours. The recommended battery, however, is a 6 volt, 20 AmpHr gel-cell (*P/N 2.32*).
- The **battery leads are color coded**: the red-insulated lead goes to the (+) and the black-insulated lead goes to the (-) terminal on the battery. Reversing the polarity of the battery leads will not harm the trap and depending on the positions of the switches, the trap will either not run (all switches open) or run backwards (fan blowing upward) with the light on (all switches closed).

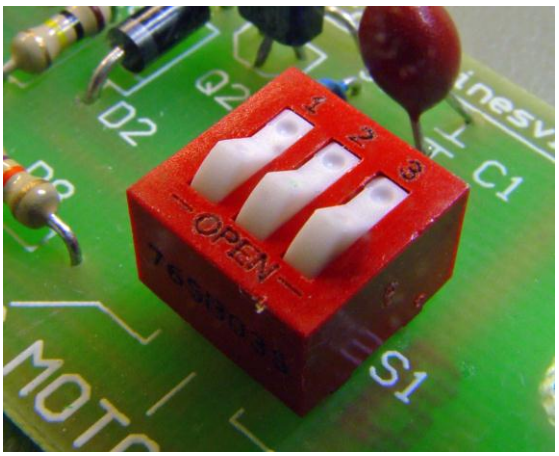
- **Recommended bulb types for the Model 1012** are: [2]

Type	Voltage	Current (Amp/hr)	Candlepower	Lifespan (hrs)
CM-47	6.3	0.15	0.52	3,000
CM-44	6.3	0.25	0.90	3,000

- **Photoswitch operation** is simple allowing the trap to be configured in several ways. Early in 2009 we modified the photoswitch circuit. Table 1 and Figure 1 are for the original version; table 2 and figure 2 are for the newer version. Both are presented here for your convenience. The table below gives the setting and functions. Access the circuit by removing the black rainshield cover (remove the three stainless/plastic cap screws on the top of the rainshield).
    - **Table 1 and Figure 1 for *original* LCS-3 circuit.** This is a one-sided board (all traces on bottom of board).

Switch number			Functionality (older version)
1	2	3	
open	**open**	**open**	Fan and light always on; operation independent of light levels.
open	**open**	**closed**	Fan always on, light switches on at dusk and then off again at dawn.
open	**closed**	**closed**	Fan and light both switch on at dusk and off at dawn; insects would fly up and be lost if the trap was not serviced before dawn.
closed	**closed**	**closed**	Fan and light both switch on at dusk; the following morning, the light goes off and the motor continues, saving the catch. *Recommended setting.*

On right is a close-up of the switch (fig. 1); all switches, 1-3 are in the **closed** position. Pressing the bottom of the white switches and making them flush with the red case by "- OPEN -" would put the switches in the **open** position. The labels for switches 1-3 are "AUTO," "MOTOR," and "LIGHT," respectively.

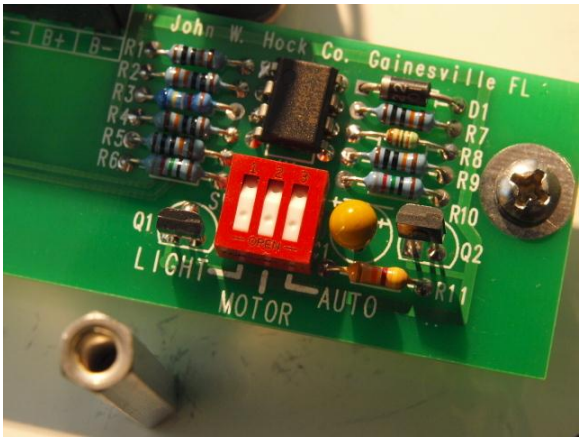


2. The trap is supplied with the CM-44 as standard.

- **Table 2 and figure 2 for *newer*, 2009 version of LCS-3 circuit.** This circuit is a double-sided PC board and the resistors and diodes are arranged in two rows above the switch.

Switch number			Functionality (newer version)
1	2	3	
open	**open**	**open**	Fan and light always on; operation independent of light levels.
closed	**open**	**open**	Fan always on, light switches on at dusk and then off again at dawn.
closed	**closed**	**open**	Fan and light both switch on at dusk and off at dawn; insects would fly up and be lost if the trap was not serviced before dawn.
closed	**closed**	**closed**	Fan and light both switch on at dusk; the following morning, the light goes off and the motor continues, saving the catch. *Recommended setting.*

On right is a close-up of the newer switch (fig. 2); all switches, 1-3 are in the **closed** position. Pressing the bottom of the white switches and making them flush with the red case by "- OPEN -" would put the switches in the **open** position. The labels for switches 1-3 are "LIGHT," "MOTOR," and "AUTO," respectively. These labels and functions are different that for the older version of the circuit (see above).



- **Photoswitch repairs.** While this circuit seldom requires servicing, repair is available from us. Simply remove the board and return it to us with a note describing the problem; alternatively, you can send the entire unit back and we will do everything. Spare boards are available and enable field personnel to quickly change out a malfunctioning circuit.

Air-Actuated Gate System

Gate-System operation (if so equipped) is also simple. Take care not to bend the counter balance rods with careless handling or storage. Each time the trap is set up, start and stop the trap several times to make sure the gates open and close without binding. If the thin gates get jammed in the closed position, knock then free with a pencil etc., dropped down through the top of the trap. *DO NOT attempt to un-jamb by applying excessive torque to the counter balance rods.*

CO_2 operation

If you ordered a Model 1012-CO_2, the New Standard Light Trap with the Photocell-Controlled CO_2 Release option, you have several additional items (see figure 1, next page):

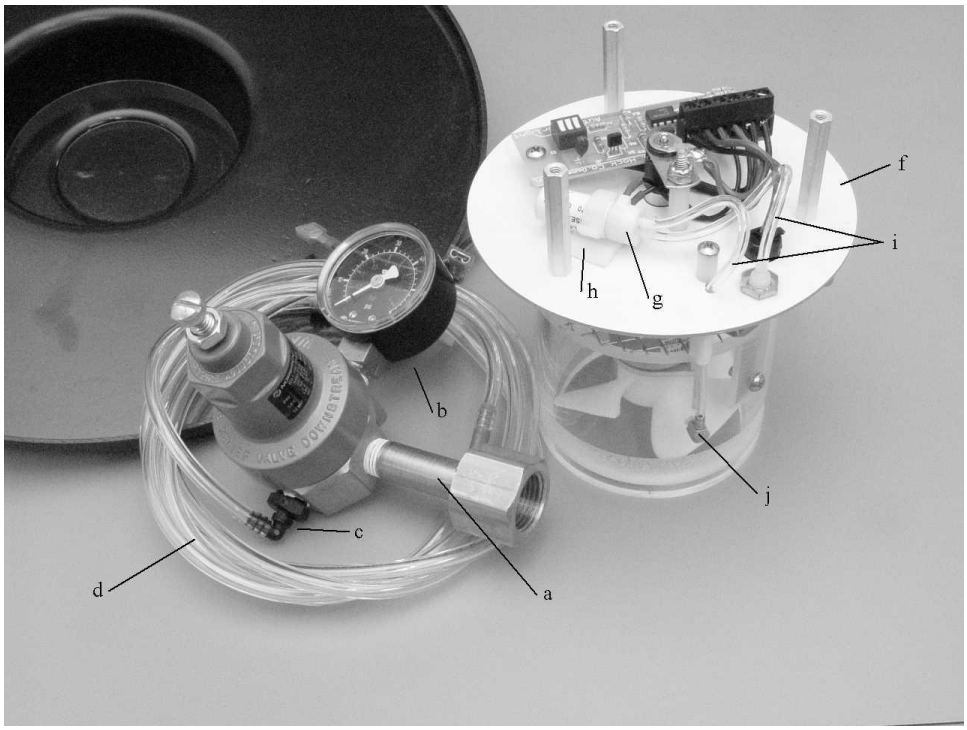


Figure 1. View of Photocell-controlled CO_2 release system with regulator.

1. The regulator unit. This includes a regulator body that has attached (1) a brass connector and white plastic washer for attachment to the CO_2 tank—a, (2) a low pressure gauge—b, and (3) a fitting to attach the CO_2 line (1/8" ID tubing) that goes up to the trap—c.

2. An approximately 6-foot long flexible tube with in-line micro-filter and the 0.007" orifice—d. This line is terminated with a female locking Luer fitting—e, and is used to attach the line to the bottom of the white aluminum plate supporting the electronics of the trap—f .

3. A solenoid-operated gas shut-off valve with two wires—g.

4. An adhesive-backed clip to attach the shut-off valve to the white aluminum plate—h.

5. Two short pieces of 1/16" ID tubing—i.

6. A 8-32 threaded right-angle fitting to connect the 1/16" ID tubing to the acrylic body of the trap—j.

7. An in-line 0.005" ID orifice (not shown) that can be used in lieu of the 0.007"ID orifice to obtain different flow rates (see table below). Combinations of pressure and orifice size to give CO2 release rates ranging from 100 to 500 ml per minute. Scientist differ as to recommended flow rates, but most recommend between 250 and 500.

Orifice diameter	Flow rate (ml per minute)	
	5 psi	15 psi
0.005"	100	200
0.007"	250	500

Details for the Model 1012-CO2 operation

Connect and tighten with a wrench the regulator/gauge to the CO_2 tank making sure the nylon washer is in place; when shipped, this thick washer is attached with a plastic tie to the regulator/gauge. Turn on the valve on the CO_2 tank and adjust the pressure indicated on the gauge using the slotted Fillister screw on the front of the regulator. The nut on the adjusting screw is a jamb nut; loosen it slightly before ad-

justing, and then tighten it a bit while holding the adjustment screw. The regulator is preset to 5 psi at our factory. After the pressure is set, connect and screw together the locking Luer female connector attached to the regulator/gauge via a six-foot long piece of 1/8" ID tubing to the male Luer fitting on the underside of the white plate.

Next to the regulator you will find an in-line 43-micron filter. Towards the other end of the 1/8" ID tube and near the female Luer fitting that attaches to the underside of the trap, an in-line orifice labeled ".007" indicating its size. Note the arrow indicating flow direction if you change the aqua orifice for the 0.005" orifice to obtain the lower flow rates.

When you set out the Model 1012-CO_2 in the afternoon, set the trap's photoswitch to turn on the fan and light at dusk and to turn off only the light in the morning—all switches CLOSED. This setting will permit the flow of CO_2 during the nighttime but not otherwise. The table below gives the approximate duration of release from a 20 lb tank of CO_2. Recognize that there is variability in tank contents and flow rates as a function of ambient temperature. The best way to know how much CO_2 is left is to weigh the tank and subtract the tare weight of the tank. Note in table below that dividing the flow time in hours by 20 lbs will give you the number of hours per pound of CO_2.

Flow rate (ml/min)	Total run time (hrs)	Number of 10-hr nights
200	420.7	42
250	336.6	34
500	168.3	17
1,000	84.1	8

Useful References

American Cyanamid Company. 1972. Modern Mosquito Control, 3rd ed. American Cyanamid Co., Princeton, NJ 30 pp.

Carpenter, S. J. and W. J. LaCasse. 1975. Mosquitoes of North America (North of Mexico). Univ. Calif. Press, Berkeley, CA 360 pp.

Centers for Disease Control (CDC), Public Health Service, U.S. Department of Health and Human Services. 1977. Mosquitoes of Public Health Importance and Their Control. (HEW Publication No. (CDC) 77-8140) 55 pp.

Louisiana Mosquito Control Assoc. 1983. Mosquito Control Training Manual. Louisiana Mosquito Control Assoc., 6601 Lakeshore Dr., New Orleans, LA 70126 ($10.00).

Mulhern, T. D. A Manual for Mosquito Control Personnel. Calif Mosq. Cont. Assoc., Visalia, CA 190 PP.

Service, M. W. 1977. Mosquito Ecology - Field Sampling Methods. John Wiley and Sons. New York, New York.