



DrugDetect™ -F1 Methamphetamine/Fentanyl Scanner

OPERATING MANUAL



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(Version June 2022)

Designed and Manufactured in the USA

Lightsense is committed to supplying quality, innovative products with reliable performance. This manual is provided to assist in the operation and proper maintenance of your DrugDetect-F1 scanner.

The DrugDetect-F1 scanner uses Photoemission/Reflection Spectroscopy to detect fentanyl and methamphetamine by illuminating the target substance at specific wavelengths of ultra-violet (UV) light to activate the relevant target molecules. Photons are returned from the target material(s) and detected and analyzed by the sensor's electronics.

This scanner detects methamphetamine at 0.1% and 1.0% concentrations and fentanyl at quantities of 100µg and 900µg in the sensor's 1/2" diameter optical beam **through plastic bags** to ensure user safety so that no contact with the substance is required.

DISPLAY INDICATORS

The LEDs on the rear panel serve as signal and scanning active display indicators.

Green (G): Scanning in progress and no “target” molecule has been found.

Methamphetamine channel:

Yellow (Y): The yellow LED illuminates when 0.1% - 1% of methamphetamine molecules in the substance scanned are detected.

Red (R): The red LED illuminates when 1% or greater of the substance scanned consists of methamphetamine.

Fentanyl channel:

Yellow (Y): The yellow LED illuminates when 100µg or greater of fentanyl molecules are detected within the sensor’s ½” diameter optical beam.

Red (R): The red LED illuminates when 900µg or greater of the substance scanned consists of fentanyl within the sensor’s ½” diameter optical beam.

The rear panel blue light (for power on and charging, labeled “STATUS”) illuminates according to Table 1 below.

The R or Y lights will remain illuminated for 60 seconds after the scan is completed. If they time out and go off and you want to remember the last result, you can cycle the scanner’s power off and then back on, and the correct R or Y LED light from the last result will come back on, and stay on for another 60 seconds, or until another scan is performed.

When the two red illuminator light beams merge at ~2 inches from the front of the device, the device is being used properly and the percent estimates for the R and Y zones are correct.

Table 1: Blue LED functions

Status	Blue LED
Power ON	Blinks @ 1 Hz
Charging with USB (plugged in)	Fades: off-on-off until charged. (Then full on when charging complete)
Charging complete, USB removed and unplugged unit is POWERED OFF	Off, when unit is off, (charger unplugged)

Upon POWER-ON of the device, the rear panel LEDs and beeper indicate the following:

Table 2: Power On LED Functions

Low battery	Yellow LED flashes 5 times + beeper @ 200Hz and unit shuts off
Internal function checks complete	All LEDs sequence + two beeps @ 500Hz
Internal error	Red LED flashes + low beep tones

The blue POWER LED blinks 5 times on POWERING UP the device. In addition to the blue LED, an internal beeper is provided as an added indicator. It activates according to the following:

Table 3: Internal Beeper Functions

Function	Beeper
No methamphetamine or fentanyl (no target signal seen)	Silent
0.1% - 1% range for meth, >100µg for fentanyl	Slow beep
>1% for meth, >900µg for fentanyl	Fast beep
Power on	3 beeps
Battery low	2 beeps and unit shuts off

Generally, the scanner will detect methamphetamine and fentanyl through a single layer of a plastic container and through two or more layers of a thin plastic bag. Note that both pseudoephedrine and methamphetamine are detected in the meth channel, since the presence of a large amount of pseudoephedrine indicates probable meth production.

Information is stored in the unit's internal computer memory, allowing software updates, diagnostics, data event storage, and date/time stamping for a permanent record of detection events as they occur. The USB cable that is included interfaces DrugDetect-F1 to a PC and provides comma delimited data for event/data logging, report generation, and printout. Note that complete instrument diagnostics are performed prior to and immediately following a logged event so that proper device operation verification is logged with the data.

Since the presence of fentanyl is not anticipated on standard surfaces outside of a container, such as items on a desk, clothing, and other places where there is

no container, the scanner effectiveness is maximized by scanning plastic bags with suspected fentanyl content [crushed counterfeit tablets, etc.] and not random surfaces. If an unknown powder is seen visually, do not approach the powder until proper protective measures are in place, since fentanyl is absorbed through the skin and is dangerous to contact or breathe.

This scanner's fentanyl function is to be used for evaluation of the presence of fentanyl only, and is not intended to guarantee absence of a life-threatening situation.

ALL DrugDetect results for illicit drugs (whether for methamphetamine, fentanyl , or others), should be considered a presumptive illicit drug identification technique only, much like chemical "spot" tests for field use, and should be followed up with detailed chemical lab testing before being used as a sole determinant for criminal prosecution (the details for this are governed by local state regulations In the US).

Technical support is available during standard business hours of 8 AM to 5 PM Mountain Standard Time (GMT - 7). Call: 1-888-736-7349 EXT. 2, or email: techsupport@lightsensetechnology.com.

When contacting Technical Support, please provide the serial number for your scanner found on the device. Also, please see Warranty Information at the end of this manual.

CAUTIONS

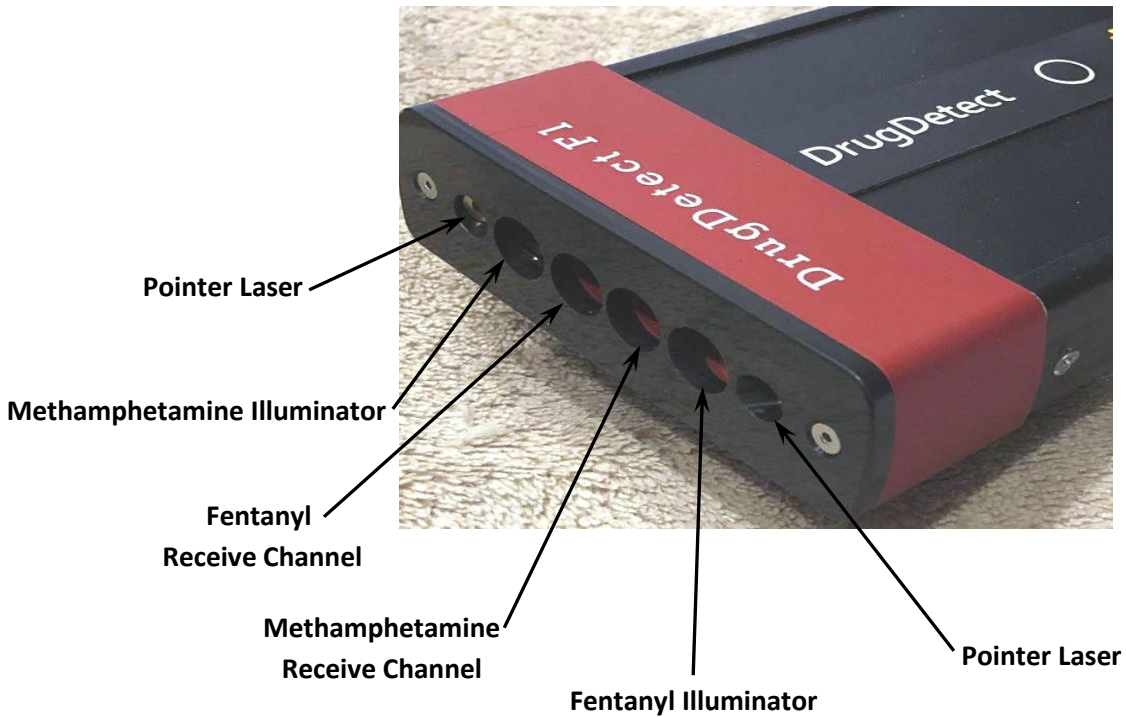
- The DrugDetect-F1 radiates ultraviolet light during operation.
- NEVER LOOK DIRECTLY INTO THE LIGHT SOURCES ON THE FRONT during operation.
- NEVER OPEN THE SCANNER. There are no user-serviceable parts inside the device.

SCANNER ORIENTATION

Back of Scanner



Front of Scanner



DRUGDETECT-F1 TECHNICAL SPECIFICATIONS

Type	Handheld, self-contained, optical non-contact illicit drug detector
Substances detected	Powdered and crystalline methamphetamine/pseudoephedrine and fentanyl w/without adulterants
Maximum sensitivity:	0.1% - 1% (yellow LED; >1% (red LED) for meth; 100µg (yellow LED), >900µg (red LED) in scanner's ½" dia. Optical beam
Environmental	-20°C to +60°C [-4° F to 140° F], non-condensing
Substance detected display	Yellow LED = trace detected; Red LED = positive above threshold + internal beeper
Operating distance	2.0 inches (51 mm)

Optical Specifications

Operating wavelength	235 nm to 450 nm
Detection method	UV photoemission/reflection spectroscopy
Scan area indicator	2 intersecting red laser pointers
Active scan area	0.5-inch diameter @ 2.0-inch standoff
Max scanning speed	0.5 inches (12.7 cm) per second
Photon collection area	127 mm ²
Substance Illumination	UV LED

Mechanical Specifications

Size	1" (H) x 3.25" (W) x 6.7" (L) (2.5 cm x 8.2 cm x 17 cm)
Unit weight	16 oz. (0.454 kg)
Case color	Black
Protective Case	4.3" (H) X 7.5" (W) X 9.1" (L)
Total weight in case	3.25 pounds (1.5kg)

Display/Controls

Positive indicator	Yellow = trace detected; Red = positive above threshold
Battery low indicator	Flashing blue LED, rear panel
Power on indicator	5 rapid flashes of blue LED, rear panel
Power on/off	Pushbutton, rear panel
Data interface	USB-C connector

Electrical Specifications

Battery life	120 days with unit off; 10 hours scanning with full charge
Power source	Li-ion rechargeable battery
Programming interface	USB-C, female
Scan switch	Membrane on side and rear panel

SYSTEM START-UP

[Refer to the scanner layout figures for locations of the various functions and indicators.]

1. Remove the DrugDetect-F1 scanner from its supplied protective case.
2. The device is charged for immediate usage.
3. Do not turn the scanner power on when the SCAN button is depressed.
4. Do not scan with the device while the USB cable is plugged in.
5. Press the POWER button once to turn the unit on, and once again for 5 seconds to turn it off. This pushbutton is located on the rear panel of the scanner.
6. The blue STATUS LED will blink 5 times upon power-up, then it will blink at a steady 1Hz when the detector power is on. Note that an automatic internal self-check of all functions occurs prior to this steady blue LED blinking. This is indicated by the 5 blinks immediately after power on (also, the last scanned value of the R or Y LED's) and will illuminate for 1 minute at power on.
7. To use the scanner, press and hold the SCAN button (on the unit's top label surface).
8. Data are recorded to the internal memory only when the SCAN button is released.
9. Once the SCAN button is released, the data must be written to the unit's internal memory, so it is recommended that you wait ~1 second before pushing the scan button again. This allows completion of the data writing cycle.

10. Hold the scanner at a distance from the sample being measured where the two red light pointer laser diodes (illuminators in the scanner's front panel) intersect to form a single dot. They intersect at a ~2-inch distance from the front of the scanner. This is the optimum distance for an accurate reading. Keep the location fixed until the scan button is released. It is not critical to be extremely precise. The merging of the targeting red beams serves to provide consistent scans by maintaining an approximate 2-inch distance.
11. The sensitive portion of the scanner's beam will be a circle approximately 0.5 inch [12.7mm] in diameter at distance of 2 inches [51 mm] from the front of the optical head on the front of the device.
12. When methamphetamine is present in concentrations between 0.1% and 1%, the yellow TRACE indicator LED will illuminate, and the beeper will beep at a slow rate. When concentrations above 1% are detected, the red POSITIVE indicator LED will illuminate and the beeper inside the scanner will beep at a faster rate.

When fentanyl is detected in amounts $>100\mu\text{g}$, the appropriate yellow LED illuminates, and the beeper will beep at a slow rate. When amounts are above $900\mu\text{g}$ are detected, the red LED will illuminate and the beeper inside the scanner will beep at a faster rate.
13. When the SCAN button is released, data relating to that measurement will be recorded in the scanner's internal memory in the following sequence: (1) An initial complete device diagnostic; (2) the actual reading of a yellow or red *positive* or a green *negative* detection; and (3) a second internal diagnostic. The scan will be complete in about one second after pressing the SCAN button. Data for each of the two channels are stored in different columns for unambiguous recording.
14. When the Li-ion battery is discharged, the unit will shut down and require re-charging via the USB connector. (The low battery indicator will beep twice before the unit shuts itself off.)

Upon POWER-UP of the device, the rear panel LEDs and beeper indicate the following:

Table 4: Power On LED Functions

Low battery	Yellow LED flashes 5 times + beeper @ 200 Hz and unit shuts off
All internal function checks complete	All 4 LEDs sequence + two beeps @ 500 Hz
Internal error	Red LED flashes + low beep tone

Note: The colored lights (R or Y) will remain illuminated for about 60 seconds after a positive scan. The light that was the result of the last recorded scan will re-illuminate for 60 more seconds after the power is cycled the next time (thus the power can be switched off and then on again, to see this last result again).

NON-DETECTION OF SUBSTANCE

The device can also be moved across a surface to cover a larger area for detection, but the motion of the detector should NOT exceed the linear speed of 0.5 inches per second (or 12.7 mm per second) and the distance to the surface of about 2 inches should be maintained. If methamphetamine or fentanyl are not detected, neither the yellow nor the red LEDs will illuminate. Some practice will allow the user to become comfortable with the sensitive detection range.

READOUT OF INTERNAL MEMORY

- Connect the scanner to a PC with the supplied USB-C cable.
- Press the DrugDetect-F1 POWER switch once to turn on the unit.
- Wait for the PC to recognize the DrugDetect-F1 connection.
- The PC will recognize the DrugDetect-F1 internal memory and will associate it with Microsoft Excel or another spreadsheet application.
- If the device is not recognized, please follow the procedure for XXXXXXXX found on the included USB flash drive.
- Open the file and observe the log entries to confirm data have been stored as desired.

TROUBLESHOOTING

Press the POWER button to turn on power to the unit. Depress the SCAN button. The two red pointer laser diodes located in the unit's optical head should illuminate.

- If the two red laser pointers are functional, hold a white piece of paper in front of the scanner (about 1 cm away). A faint blinking blue light should be visible near the red laser diode pointers. It may be necessary to dim room lights to view this light. Also, a square brighter blue illumination should be seen blinking.
- If no blue light is visible on the white paper, return the unit to the factory for repair.
- If a known sample of methamphetamine or fentanyl is not detected as indicated by illumination of the yellow and/or red LEDs, please contact the factory for further troubleshooting or return the unit to the factory for repair.
- Cleaning of the optical components can be performed with a soft cloth and eyeglasses cleaner. This should only be done if the surfaces are contaminated with fingerprints or foreign matter. Do not spray liquids directly onto the optical components. Instead, spray the liquid cleaner on a cloth and then carefully wipe the surface. Cotton swabs are a suitable alternative for cleaning.

GENERAL CARE

- Do not store electronic devices or other objects on top of the DrugDetect™-F1 device.
- Store in a cool, dry place and never leave the unit exposed to direct sunlight for long periods.

DRUGDETECT™-F1 PACKAGE CONTENTS

For the Law Enforcement (LE) version of DrugDetect-F1, the following are included in the package as shipped from the factory:

1. Hard carrying case
2. DrugDetect-F1 scanner unit, fully charged
3. Manual and all other instructions on USB flash drive
4. USB-C to USB-A male cable for charging and data retrieval



The DrugDetect™ -F1 scanner is manufactured by Lightsense Technology, Inc., licensed under US patents: 7,154,102; 8,502,168; 8,848,173; and 9,013,686.

Battery Safety

The DrugDetect-F1 is equipped with a Li-ion rechargeable battery pack for long, reliable operation. This battery pack is not user-serviceable. Report any battery malfunction to the factory for proper replacement.

Charging Operation

Plug the USB-C cable into the rear panel of the unit, labeled CHG/DATA, and the USB-A end of the cable into a suitable charging source (e.g., PC, auto USB charge port, or other USB charging port) and leave the unit in the OFF state. The blue LED will fade from off/dim to full, and cycle, gradually, during the charging process. The blue LED will remain on when the unit is fully charged and still plugged in and go off when the unit is unplugged (and go back on, and blink at 1 Hz when unit is turned back on).

Charging a fully discharged battery will require approximately ~4-5 hours.

It is normal for the DrugDetect-F1's outer case to become warm when charging the battery.

One-Year Warranty

Lightsense Technology, Inc. guarantees the DrugDetect™-F1 to be free from defects in workmanship and materials and to operate within specifications for a period of one year. A separate card is provided with details about this warranty. During this period, Lightsense Technology, Inc. will repair or replace, at its option, any component found to be defective without cost to the owner, providing the unit is returned to the factory or a Lightsense authorized warranty service center.

The full warranty on parts and workmanship does NOT include normal wear and tear, or damaged caused by crushing, dropping, fire, high impact, or water immersion, as well as damage from attempted repair, modifications by unauthorized service agents, or improper voltage and charging.

For repairs, simply return the unit (shipping prepaid) directly to the factory or to a Lightsense authorized warranty service center. Refer to section: Service Return Procedure (below). Also, see warranty certificate below.

One-Year Warranty Exception

If you purchased the DrugDetect-F1 through a special buying program, such as a state purchase contract, etc., the above warranty may not apply. Please refer to the buying program contract for the appropriate warranty terms or contact Lightsense Technology, Inc.

Warranty Certificate



At Lightsense Technology, we stand behind our products with a limited one-year warranty.

Should you experience any defects in materials or workmanship within the warranty period, Lightsense Technology will repair or replace the defective product, subject to the following conditions:

- Our obligation under this warranty is to the original purchaser only and may not be transferred.
- Product replacement does not include inbound shipping costs.
- Lightsense reserves the right to examine product in question.

This warranty relates to defects in manufacture, materials, or workmanship in a Lightsense Technology DrugDetect spectrometer. It does not extend to:

- Normal wear and tear, scratches, or accidental damage.
- Damage resulting from negligence, use other than the intended purpose as described in the product manual, or the misuse of any kind, such as crushing, dropping, high impact, fire, or water immersion.
- Damage from attempted repair, modifications by unauthorized service agents, or improper voltage and charging.

Lightsense will not service received items when:

1. The item is inspected and found to be not covered by the warranty.
 2. The item is inspected and found to be damaged during shipment due to lack of proper packaging.
- Return shipment of such products will be at the expense of the customer.

For products that are still under warranty but have been discontinued or unserviceable, a pro-rated credit towards a purchase of another similar product will be issued.

For Warranty Services, please contact:

1-888-736-7349
www.lightsensetechnology.com
techsupport@lightsensetechnology.com

Lightsense Technology, Inc.
9420 E. Golf Links Rd.
Ste 108/PMB179
Tucson, AZ 85730



Service Return Procedure

If you have questions, want a quick problem diagnostic, or need to return your DrugDetect-F1 to the factory:

Contact Lightsense Customer Service and ask to speak with a Customer Service Representative. Have the serial number of the unit available. The serial number is located on the bottom of the scanner case.

Email: techsupport@lightsensetechnology.com

If you need to return your DrugDetect™-F1 to Lightsense:

- Ask for a Return Authorization Number. You will need to provide the serial number of the DrugDetect-F1 that is to be serviced.
- Return ALL of the unit's parts in the original packaging (shipping prepaid).
- If so directed, include a note describing the problem and/or the incident that resulted in the problem. Failure to do so can delay the return of your device.
- Based on the information you provide, the Customer Service Representative will issue a return authorization (RMA) number. Write the RMA number on your note and shipping label.
- Return the unit to:

Lightsense Technology, Inc.
9420 E. Golf Links Rd., Ste 108/PMB179 Tucson, AZ 85730
Tucson, AZ 85730 USA
RA# XXXXXX

The customer is responsible for all shipping charges to the Lightsense service location. Lightsense does not accept incoming COD shipments. Lightsense will pay for shipping the unit from the repair facility to the customer, provided the system is still under warranty. Lightsense will charge the customer for any shipping charges above the initial \$25. If you want to ship your package express or next day air, Lightsense will invoice you for these freight charges.

If your DrugDetect-F1 is out of warranty and you would like to know the cost of repairs prior to the actual repair work being performed, Lightsense will provide a repair estimate. Nominal charges include \$170 US per hour for labor or a flat fee of \$500 US for nominal service, depending on the nature of the repair. To obtain an estimate, request it either on the paperwork you submit with the device when you ship it to Lightsense for service or when you obtain a Return Authorization (RMA) number. Lightsense provides estimates only upon request.

The initial charge for an estimate is currently \$100 US per unit if your DrugDetect-F1 is not under warranty, plus any return shipping and handling fees. If, after reviewing the estimate cost, you

decide not to have your unit repaired, you will be invoiced a \$100 minimum charge. If you decide to have your DrugDetect-F1 scanner repaired, you do not owe the estimated charge (the charge is waived) and only pay the amount stated in the estimate.

Thank you for purchasing this product from Lightsense Technology, Inc., designed and manufactured in the USA. Please examine the website below for continually updated information on our DrugDetect products and email us any and all comments or questions at the email below:

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