

DrugDetect™-F1

Fentanyl and Methamphetamine Detector

OPERATING MANUAL



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techsupport@lightsensetechnology.com

OPERATING INSTRUCTIONS

This manual is provided to assist in the operation and proper maintenance of the DrugDetect-F1 detector.

The DrugDetect-F1 detector 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 detector detects methamphetamine and fentanyl either pure or in mixtures (cutting agents) using the enclosed light shield with an aperture of 0.33" **through a transparent polyethylene plastic bag** or plastic wrap to ensure user safety so that no contact with the substance is required. (Standard supermarket plastic bags or plastic wrap can be used.)

The DrugDetect-F1 is designed to detect fentanyl and methamphetamine, either pure or mixed with other substances.

The measurement should be done with the light shield attached and the aperture of the light shield placed directly on the substance to be measured in a polyethylene bag or under polyethylene wrap (bags and plastic wrap sold in supermarkets are generally polyethylene).

Measurements done with the substance in a polyethylene plastic bag is for officer safety (evidence bags made with polystyrene, are not transparent to the UV light being used by the F1). If the substance is in pill form, the pills should be crushed while in the polyethylene bag using the supplied pill crusher from outside of the bag.

The correct measurement procedure can be seen in the training video on the product page of www.lightsensetechnology.com.

DISPLAY INDICATORS

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

On turning the unit on, all the LEDs flash in sequence as the instrument undergoes internal diagnostics and calibration.

Status/Scanning channel: Solid green LED indicates scanning in progress. Flashing green after a scan means nothing has been detected.

Methamphetamine channel: The red LED illuminates (flashes) when the substance scanned contains methamphetamine within the 0.33" aperture in the light shield.

Fentanyl channel: The red LED illuminates (flashes) when consists of fentanyl either pure or in a mixture within the 0.33" aperture in the light shield .

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

If the result is positive, the red LEDs will remain illuminated for 60 seconds after the scan is completed or until another scan is performed.

The device is being used properly when the light shield is on and placed directly on the substance to be measured. The measurement aperture is illuminated with the two red lasers pointer beams.

Table 1: Blue LED functions

Status	Blue LED
Power ON	Blinks @ 1Hz
Charging with USB plugged in	Fades off-on-off until charged. Solid blue when charging complete.
Charging complete, USB removed and unplugged and 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	Three beeps at 200Hz, then power off (no LED light)
Internal function test	The unit sequences through all lights. After LED light sequence: READY: 2beeps at 500Hz with blue light flashing FAIL: 4 beeps at 500Hz with red methamphetamine LED flashing
Internal error	Red LED flashes with low beep tones

When POWERING UP the device, all lights come on for the internal test. The device is ready when the blue light is blinking. An internal speaker is provided as an added indicator. It activates according to the following:

Table 3: Internal Sound Functions

Function	Beeper
No methamphetamine or fentanyl (no target signal detected)	Silent
Fentanyl or methamphetamine detected	5 beeps
Power on	2 beeps
Power on with error	4 beeps at 200Hz
Bad measurement	Cycles through flashing red LEDs
Battery low	3 beeps and unit shuts off

Generally, the detector will detect methamphetamine and fentanyl through one or more transparent polyethylene plastic bags or polyethylene plastic wrap (up to 4 mil, or 0.1mm, total thickness). Plastic bags and plastic wrap sold in supermarkets are typically polyethylene.

Note that both pseudoephedrine and methamphetamine are detected in the methamphetamine channel, since the fluorescing chromophore of pseudoephedrine is preserved in the synthesis of methamphetamine. The presence of a large amount of pseudoephedrine indicates probable methamphetamine 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 of events. The USB cable interfaces DrugDetect-F1 to a PC and provides comma-delimited data for event/data logging, report generation, and printout. Note that instrument diagnostics are performed prior to executing each scan.

If an unknown powder is discovered, the powder should not be approached until proper protective measures (PPE) are in place, since fentanyl is absorbed through the skin and is dangerous to both touch and inhale.

This DrugDetect-F1's fentanyl channel is used to evaluate the possible presence of fentanyl only and is not intended to guarantee absence of a life-threatening situation.

All DrugDetect-F1 results for illicit drugs (methamphetamine or fentanyl), should be considered a presumptive identification only and should be followed up with sensitive chemical laboratory testing before being used for criminal prosecution (the details are governed by state regulations in the US).

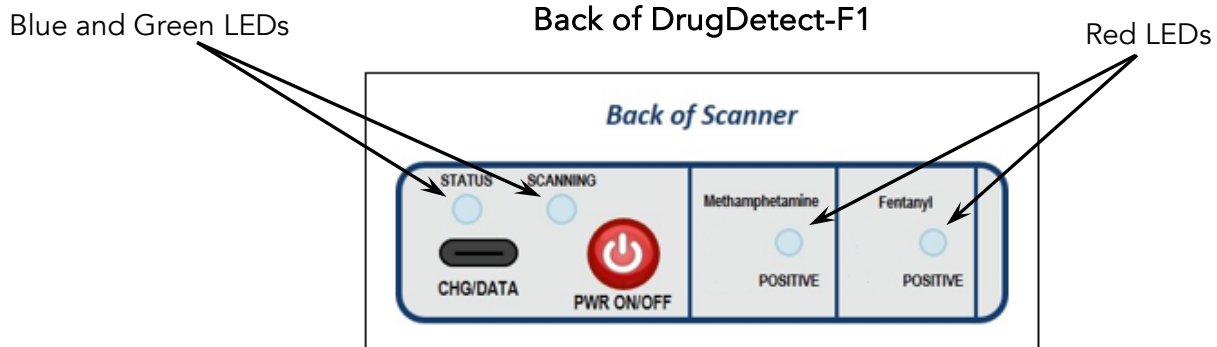
Technical support is available during standard business hours of 8 AM to 5 PM Mountain Standard Time. Call: 1-888-736-7349 or email: techsupport@lightsensetechnology.com.

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

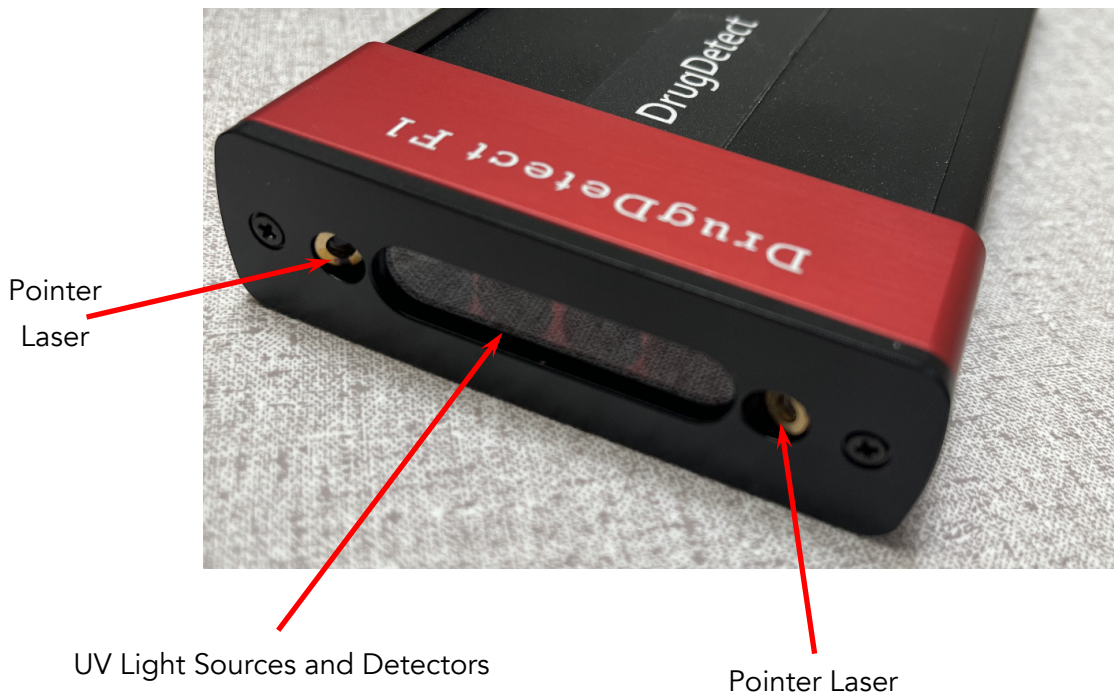
WARNINGS

- The DrugDetect-F1 radiates ultraviolet light and laser light during operation.
- NEVER LOOK DIRECTLY INTO THE LIGHT SOURCES ON THE FRONT DURING OPERATION.
- NEVER OPEN THE DETECTOR. There are no user-serviceable parts inside.

DETECTOR DESCRIPTION



Front of DrugDetect-F1



The DrugDetect-F1 package contains a light shield, which eliminates stray, interfering light (UV portion of the solar spectrum) and provides the correct 2 inch measuring distance to the substance, and a tool to crush pills inside a plastic bag.

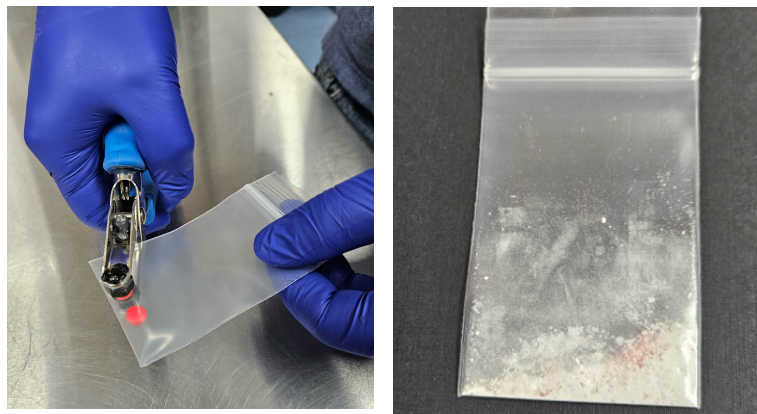
LIGHT SHIELD



Left: The supplied light shield attaches to the DrugDetect-F1 unit.

Right: The light shield should be placed directly on top of the polyethylene bag containing the substance to be measured. The pointer lasers illuminate the measuring area through the aperture in the light shield, as seen in the viewport on the side.

PILL CRUSHER



Left: The pill crusher should be used outside the polyethylene bag containing a pill.

Right: Powder from 1-3 crushed pills in a polyethylene bag.

DRUGDETECT-F1 TECHNICAL SPECIFICATIONS

Type	Handheld, self-contained, optical detector
Substances detected	Powdered and crystalline methamphetamine or pseudoephedrine and fentanyl w/without cutting agents
Maximum sensitivity:	>0.5% for fentanyl in the 0.33" (8.4 mm) aperture in the light shield (methamphetamine is usually found in highly pure form)
Environmental	-4° F to 140° F (-20°C to +60°C), non-condensing
Substance detected display	Red LED + internal beeper means positive above threshold
Operating distance	2.0 inches (5.1 cm) – set by light shield

Optical Specifications

Operating wavelength	250 nm to 600 nm
Detection method	UV photoemission/reflection spectroscopy
Scan area indicator	Light shield provides the correct distance to substance. 0.33" diameter aperture defines the active scan area.
Photon collection area	0.086 in ² (0.55 cm 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) (10.9cm X 19.1cm X 23.1cm)
Total weight in case	3.25 pounds (1.5kg)

Display/Controls

Positive indicator	Flashing Red = positive above threshold
Power on indicator	1Hz blue LED blinking (No USB plugged in) Blue led fading in and out while charging
Power on/off	Pushbutton, rear panel
Data interface	USB-C connector
Negative indicator	Green LED flashes

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 switch on top panel

SYSTEM START-UP

Refer to the detector layout figures for locations of the various functions and indicators.

1. Remove the DrugDetect-F1 detector from its supplied protective case.
2. The device is charged for immediate usage.
3. If the SCAN button is depressed while powering on, it will do the power-on beeps and start a scan.
4. Do not scan with the device while the USB cable is plugged in.
5. When scanning materials for the presence of fentanyl and methamphetamine, the light shield should be attached to the unit, which defines the distance to the substance to be scanned at 2 inches. Two red laser pointer dots should be overlapping in the aperture of the light shield when the green scan button is pressed.
6. DrugDetect-F1 should be kept as steady as possible during the measurement process and held in a vertical position to the target substance with the light shield in contact with the substance. For fentanyl detection, the substance to be measured should be inside a polyethylene bag or covered with polyethylene plastic wrap.
7. To operate the DrugDetect-F1, use the following procedure:
 - a. To turn the unit on, press the red power button on the rear panel once. To turn the unit off, press and hold this same power button for at least 4 seconds. The startup process illuminates all the rear panel LEDs as a visual check of proper operation and provides two audible "beeps" when the startup is complete. If the power is on, the blue rear panel LED blinks at 1 Hz.
 - b. If left unused, DrugDetect-F1 will automatically turn itself off after 5 minutes.
 - c. If the unknown substance to be measured is suspected to be fentanyl, it should be placed inside a polyethylene plastic bag, or covered with polyethylene plastic wrap.
 - d. With the light shield on, the unit should be positioned directly on top of the substance to be measured. The coinciding red laser spots are activated for 1 second and illuminates the center of the aperture in the light shield. The measurement is made on the total area defined by the aperture.

- e. The green measurement button on top of the unit needs to be pressed only once and released. Once the button has been pressed, the measurement proceeds automatically. The button can be pressed again to perform another measurement after a delay of at least 4 seconds.
- f. The green “SCAN” LED on the rear panel will illuminate during the approximately 4 seconds of the measurement cycle; the green “SCAN” LED goes off when the scan is complete.
- g. When methamphetamine or fentanyl is detected, the red LED of the appropriate channel on the rear panel illuminates and the unit beeps according to the table below:

CHANNEL	ILLUMINATED	BEEPER
Methamphetamine channel	RED: methamphetamine detected in aperture area	5 beeps, high tone
Fentanyl channel	RED: >0.5% fentanyl detected in aperture area	5 beeps, high tone
Status/Scanning channel	GREEN: No detection	none

Note: The red LEDs will remain illuminated for 60 seconds after a positive scan.

- h. The measurement button on the unit’s top can be pressed again after at least 4 seconds following the measurement cycle. This allows the data to be written to the unit’s internal memory.
- i. When the Li-Ion battery is fully discharged, the unit will shut down and require re-charging via the USB connector. (The low battery indicator will beep three times before the unit shuts itself off.)

FAULT CONDITION

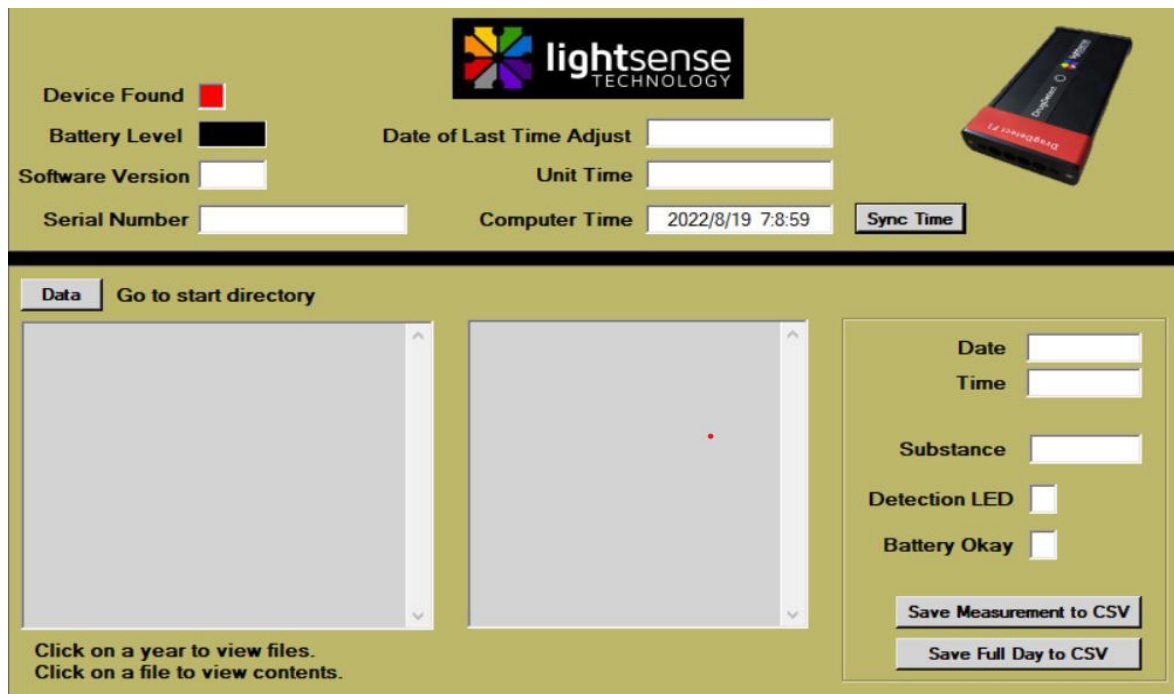
1. A fault is indicated by cycling through both flashing red LEDs on the rear panel being illuminated at the same time, along with a low warning beep from the unit's internal beeper. Wait 4 seconds and re-take the measurement while holding the detector still with the light shield positioned on top of, and touching, the substance, or, in the case of fentanyl, the plastic bag holding the substance.
2. If the fault condition continues, call tech support [1 888-736-7349]
3. The fault can be caused by excessively moving the device (or target) during the 4-second scan, or other hardware or software issue, generally a rare occurrence, so the scan should be repeated.
4. Data from the scan are stored in the unit's internal memory. The data are written after the scan has been completed. The USB flash drive contains all necessary instructions and software to access the data, as well as the complete manual.
5. Please observe appropriate safety precautions when the red fentanyl LED illuminates, as ingestion of fentanyl in quantities greater than 1.5 mg can be fatal and skin contact or inhalation of powder can be hazardous.
6. NOTE: The DrugDetect-F1 uses ultraviolet light technology, and this wavelength does not penetrate glass objects, such as car windows or glass jars. Up to 3 layers of polyethylene plastic bags (4 mils, or 0.1mm, total) or polyethylene plastic wrap transmit sufficient ultraviolet light to produce an accurate reading. If the polyethylene is >4 mil, the measurement accuracy will decrease.
7. Charging via the supplied USB cable is recommended every two weeks under normal operating conditions. This should be with a desktop computer or dedicated USB charger. Laptop computers typically do not provide sufficient charging current for the DrugDetect-F1.

READOUT OF INTERNAL MEMORY

1. Access the software on the USB drive or at www.lightsensetechnology.com to access and save to desktop to store data. There is no installation process for the application other than copying the application (“drag and drop”) file to your desktop for ease of use.
2. Turn the unit on using the rear panel On/Off switch.
3. The unit will self-check as indicated by the rear panel LED’s lighting in sequence, followed by two beeps from the internal speaker.
4. Connect the USB-A to USB-C cable between the unit and the PC and wait for any updating your PC might do.
5. Use the Lightsense provided software to access and store data. Data can be downloaded in an Excel CSV format.

VIEWING STORED DATA FILES

1. Copy the file “Lightsense_F1_User_GUI.exe” from the USB Flash Drive or download it from the Lightsense website and paste it on your desktop and open the application. The following screen will appear:

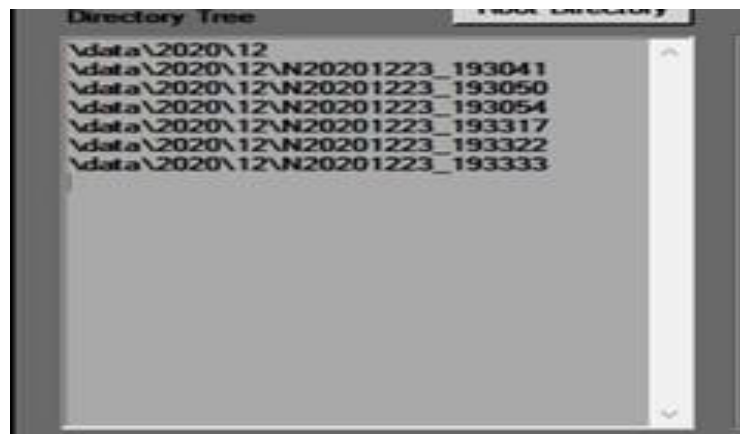


“Device Found” is illuminated green, and the Battery Level is shown. Additionally, the device serial number is indicated, along with your PC’s time and the device time. If these are different, click “Sync Time” and update the unit’s clock.

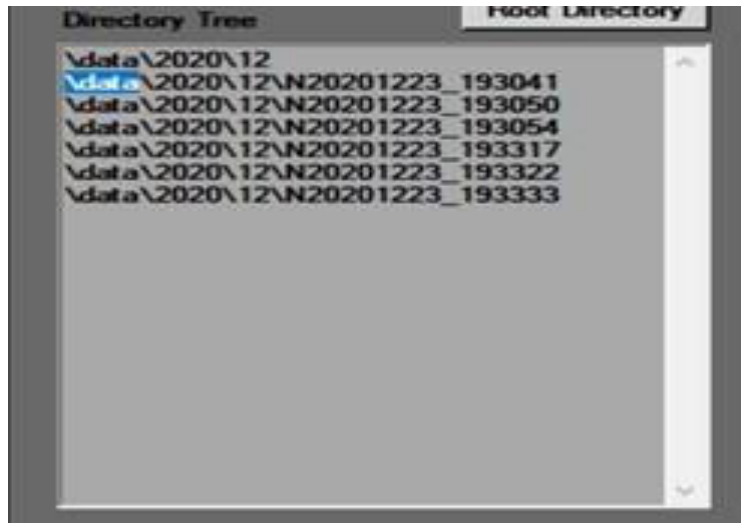
2. The lower left window on the screen is where the data files will be listed as shown below (typical data):



3. If no data files appear, click “Root Directory” to display them. The files are displayed by year (in the example it is 2020) and month. Double-click the desired year to reach the month screen shown below.



4. Double-click on the “12” to see files in December, 2020. A typical screen is shown below.



5. Double-click on the desired data file, listed by date, to see the scan result and other stored information. Format for the files is: \data\\<month mm>\N<year yyyy><date mmdd>\<time 24-hour>
6. When a data file is highlighted (double click), its detailed data are displayed in the lower right--- click anywhere in the file to highlight it. See typical screen below.
7. Explanation of screen features:
 - File Name; Format described above
 - Serial Number: Internal unit serial number
 - Unit Time: Time as set at the factory or last Adjust internal to the unit
 - Computer Time: Time as read from your computer
 - Sync Time: Makes the unit time the same as the computer time
 - Temperature: Ambient temperature at time of measurement
 - Source current: UV emitter LED current at time of measurement, nominally 34 mA
 - Battery Voltage: Current battery voltage; when connected to a computer, this will show the charger voltage
 - Error Code: Displays any errors detected during the measurement

- Save to CSV button: Click to save a selected file and all of its information to your computer
8. Save to CSV button details:
- It is recommended that a Data folder be set up on your desktop or wherever you desire to store the data.
 - When the “Save to CSV” button is clicked, and a file is selected from the list on the lower left side (multiple files can be selected by clicking on the files while holding down the “Ctrl key” on your computer and selecting the desired multiple files for storage), the selected files are stored. Select the desired destination for the file. An example is “desktop” or wherever you created the Data folder. Files are stored in Microsoft Excel© form.

TROUBLESHOOTING

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

1. If the two red laser pointers are functional, hold a white piece of paper in front of the detector at a distance of approximately 2 in. A faint blinking blue light should be visible in area of the red laser diode pointers. It may be necessary to dim room lights to view this light.
2. If no blue light is visible on the white paper, return the unit to the factory for repair.
3. If a known sample of methamphetamine or fentanyl is not detected as indicated by illumination of the red LEDs, please contact the factory for further troubleshooting or return the unit to the factory for repair.
4. Cleaning the front quartz window can be performed with a soft cloth and/or a liquid cleaner if the surface is contaminated with fingerprints or foreign matter. Cotton swabs are a suitable alternative for cleaning.

GENERAL CARE

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

DRUGDETECT-F1 PACKAGE CONTENTS

The following are included in the package as shipped from the factory:

1. Hard carrying case.
2. DrugDetect-F1 detector unit, fully charged (>90%).
3. Black light shield with a 0.33" diameter aperture and side opening to view the measurement area.
4. Manual and all other instructions on USB flash drive.
5. USB-C to USB-A male cable for charging and data retrieval.
6. 110/220VAC wall charger.
7. "Pill crusher" to prepare crushed tablets to fine powder inside polyethylene plastic bag for measurement of sample---the DrugDetect-F1 does not detect through a typical tablet outer coating.
8. 1 Test Reference sample for a positive methamphetamine signal (Pseudoephedrine)
1 Test Reference sample for a no-detection signal: Cane Sugar

PATENTS

The DrugDetect™-F1 detector is manufactured by Lightsense Technology, Inc., 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., Desktop PC, auto USB charge port, or wall charger) 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.

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 any component found to be defective without cost to the owner, provided 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 damage 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.

An extended warranty can be purchased starting in Year 2 of ownership. The cost of the extended warranty is \$800 per 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



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 detector case.

Email: techsupport@lightsensetechnology.com

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

- Ask for a Return Authorization (RA) 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.
- 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 number. Write the return authorization number on your note and shipping label.
- Return the unit to:

Lightsense Technology, Inc.
975 W Grant Rd, STE 105
Tucson, AZ 85705
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 back to the customer, provided the system is still under warranty.

If the DrugDetect-F1 is out of warranty and the customer 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 (RA) number. Lightsense provides estimates only upon request.

The initial charge for an estimate is currently \$100 US per unit if the DrugDetect-F1 is not under warranty, plus any return shipping and handling fees. If, after reviewing the estimate cost, the customer decides not to have the unit repaired, Lightsense will invoice a \$100 minimum charge. If the customer decides to have the DrugDetect-F1 detector repaired, only the amount stated in the estimate will be charged.

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 address below:

Lightsense Technology, Inc.
975 W Grant Rd, STE 105
Tucson, AZ 85705
RA# XXXXXX

www.lightsensetechnology.com

techsupport@lightsensetechnology.com

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Methamphetamine/Fentanyl Detector

Lightsense Technology, Inc.

975 W Grant Rd, STE 105

Tucson, AZ 85705

Ph: 888 736-7349

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Designed and Manufactured in the USA