Version

2.02

LDARtools

phx42™ Manual

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For Sales & Service Contact

geotech

2650 E. 40th Ave. • Denver, CO 80205
Phone 303-320-4764 • Fax 303-322-7242
1-800-833-7958
www.geotechenv.com

To confirm that this is the most current version, please go to
http://www.ldartools.com/#resources
OR
Go to the Customer Support Portal and Open the "Docs" section.

Table of Contents

Welcome to the LDARtools Family

We are excited that you have chosen the **phx42** as your VOC analyzer. The **phx42** is designed to work for you.

If you are not getting the results you want, we WANT TO HEAR ABOUT IT—immediately.

LDARtools Technical Support

At LDARtools, we want to ensure that you get the maximum performance from all of the software and equipment that we offer. We have made every effort to provide you with a comprehensive manual to assist you with using our products. If you are having issues with any of our products, please contact us for assistance right away.

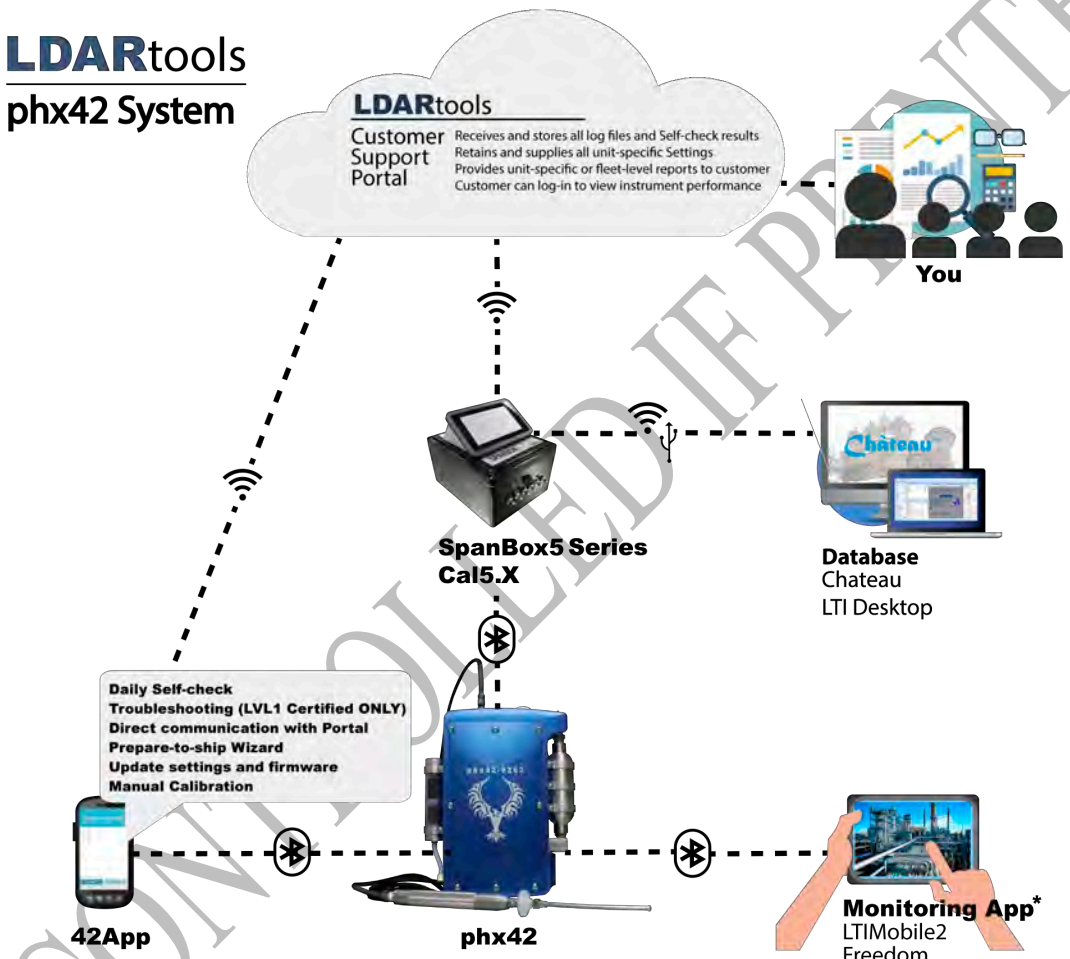
For general questions, you can consult a member of LDARtools Technical Support Team by emailing support@ldartools.com.

For equipment or software issues and before beginning any repair contact LDARtools Technical Support Team by following these directions:

1. *Do* either:
    a. *Self-Check* and *Submit* using the phx42 app.
    b. *Report an issue* at LDARtools.com. Click **Support**, login, then Report Hardware Issue.
    Only use this method if the Self-Check option is not possible.
2. If a confirmation email is not received within 30 minutes, please *email* support (support@ldartools.com).
3. *Stand by* for instructions from the LDARtools Technical Support Team.

REMINDER: Equipment being shipped to LDARtools for repair must have a Return Merchandise Authorization (RMA) printed and in the box. Failure to do so will result in extra processing and diagnostic expense and time. The only exception would be written instructions from LDARtools Technical Support Team.

The Big Picture



42App and SpanBox5 can communicate with the Portal via WiFi or Cellular. Optional Wasp is available, if needed.

*Software selection will dictate compatible handheld options. Contact sales@ldartools.com for a copy of the **Compatible Handheld Devices PDF**.

Section 1

Start-up Guide

Intended Use

The **phx42 analyzer** can be used to safely collect data in Class 1, Division 1 hazardous locations. This includes:

- Refineries & Chemical plants
- Gas or oil pipelines
- Compressor and pump stations
- Oil field production facilities
- Anywhere VOCs are present
- Indoor and outdoor environments

The **phx42** must be installed in a backpack while in hazardous locations.

- The **phx42** should be upright in the pack with the north end (with **probe port**) facing up.
- The **phx42** must not share a pocket with any other items or tools.
- Backpack should fit snugly so the **phx42** does not tilt away from the tech or tip over. This can cause probe kinks.

Overnight equipment storage and calibration should be done indoors at or near room ambient conditions (15-25 °C or 59-77 °F) with a maximum humidity of 85%.

Comprehensive List of phx42 Skills

Normal Operations

1. *Clean* it
2. *Power* it ON/OFF
3. *Know* the end-of-day sleep mode procedure
4. *Change* **Filter**
5. *Ignite* it
6. *Connect* and *Disconnect* to the 42App or your Monitoring Software
7. *Fill* Hydrogen
8. *Confirm* that the **Hydrogen Cap** is in place
9. *Attach* unit to **Charger**
10. *Confirm* that the **Charging Port Cover** and **Tether** are in place
11. *Take* a PPM Reading
12. *Initiate* a self-check using Cal5.0 OR the 42App
13. *Block* the **Probe tip** during the self-check process
14. *Calibrate* using Cal5.0 OR Manually Calibrate
15. *Report* issues to LDARtools using the Customer Portal (*if there is no Level 1 Technician on-site)*
16. *Perform* the Probe Integrity Inspection (weekly)

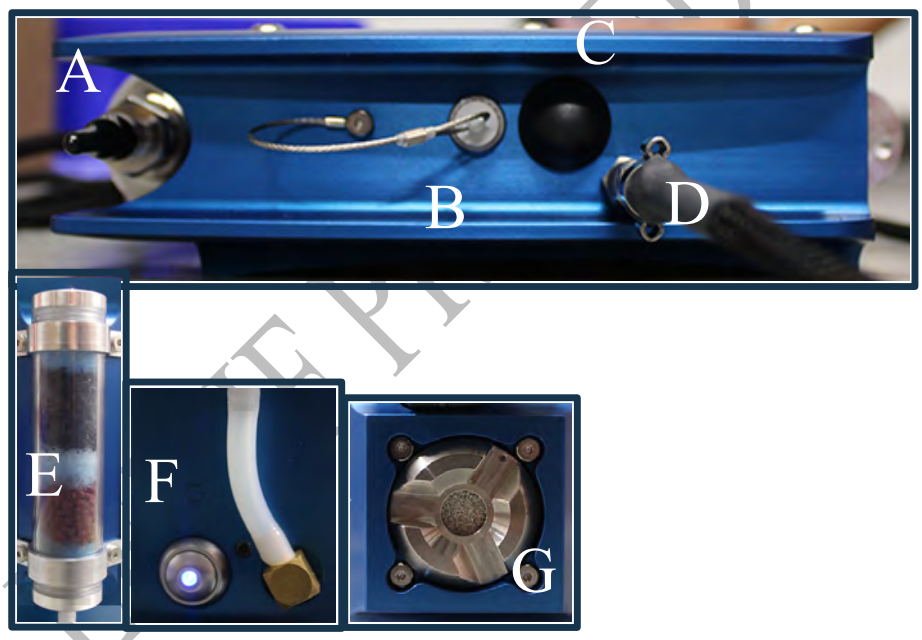
Level 1 Certified Operations

1. *Verify* that you have most current version of phx42 Manual
2. *Receive* it after shipping
3. *Initiate* the Prepare-to-Ship Wizard
4. *Update* the 42App firmware
5. *Set* a PPM Alarm
6. *Set* a Response Factor other than 1
7. *Troubleshoot* issue with LDARtools Customer Support
8. *Repair* a **Probe**
9. *Remove* broken **probe tip filter**
10. *Replace* **Scrubber filter medium***
11. *Replace* the **Glow Disk***
12. *Replace* the **Battery***
13. *Replace* a **Pump***
14. *Collect* Inspection records with the Basic Survey Mode

**Only after reporting an issue on the customer support portal.*

External Parts

- The connection end (north end) contains the following:



  A. **Hydrogen fill port/H2 Quick Fill**

  B. **Charging port/Charging port cover and tether***

  C. **Bluetooth® antenna**

  D. **Probe port**

- Side panels contains the following:

  E. **Scrubber** (west end)

  F. **Power button** (west end)

  G. The **FID exhaust** (flame arrestor end cap assembly) is located on the side of the enclosure (east end).

- The **phx42** enclosure

  - Enclosure is a two-part (lid and base) aluminum housing with a serial number on top. It also has important manufacturer information and certification labeling at the bottom.

TECH TIP: If the **H2 Quick Fill Cover** or the **Charging Port Cover** are EVER missing, you should not take the **phx42** into a hazardous location.

*Pictures of the charging port with the cover removed are available in the charging section.

Connecting the Probe

1. *Align* the **quick disconnect** (A), which is attached to **probe hose** (B), with the **probe port** (C).
2. *Snap* the **quick disconnect** into the **probe port**.

REMINDER: The **probe** and a **probe tip filter** should be connected to the **phx42** before igniting the device (unless performing filter detection calibration).

Never operate the **phx42 pumps** without a **filter** in place. Do not remove the **filter** on a running **phx42**.

FAQ	**Can I use an extension/other probe on the phx42?** *Any device certified for use in hazardous environments using modern standards is done so with accessories defined or attached. The* phx42 *was certified with the basic* probe*. You should consult your safety department for a hazard assessment before using a different* probe. *Any extension should not exceed 20ft of tubing with minimum ID of 1/8". The tubing in the standard probe is 1/16" and cannot be used as a base for an extension probe. The extension probe should utilize the same filters as the standard probe.*
	Why is the probe handle so heavy? *The* **probe handle** *was made from stainless steel to comply with the applicable safety standards.*

TECH TIP: When using the **probe**, a few basic points should be kept in mind while using it daily:

1. When moving from place to place and not actively using the **probe** for inspections, the **probe handle** should be attached to the backpack so that it isn't accidentally dropped.
2. When using the **probe**, pay attention to the **probe hose** and avoid snagging or pulling on it. This can place undue stress on the connections and potentially cause a leak.
3. Be mindful of the **probe filter** and **tip**. Dropping the **probe** onto the **filter** or prying with the **probe tip** can potentially break the **filter** and either lodge plastic in the fitting at the end of the **probe** or cause leaks at the **filter** interface.
4. Never mar or scratch the center of the **Leur lock fitting** where the sealing is occurring. Doing so will lead to leaks and repairs of the **probe**.
5. Make sure the **phx42** is oriented in the backpack so that the probe connection is not pinched, or kinked while being used.

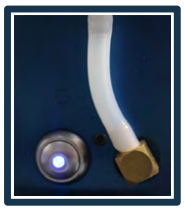
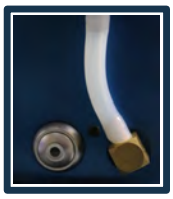
Disconnecting the Probe

1. *Pull* the collar on the **quick disconnect** to release **probe.**
2. *Pull* **probe** off gently.

Power Button

Unit is	And You	Then
OFF	*Press* and *Hold* for 2 seconds	Unit will turn ON.
ON	Triple *Tap*	Unit will ignite.
ON	Quadruple *Tap* (4x)	**SLEEP MODE** Unit shuts off solenoid, stopping flow of hydrogen. Flame will go out. **Pump** will run for an additional 30 seconds (to evacuate moist air for the FID). **Bluetooth** will stay active. THIS is the typical end-of-day process.
ON	*Press* and *Hold* for 5-8 seconds	**POWER DOWN** Unit will power down. This is a hard power off. This process should be avoided unless shipping or having connection issues.

Power Button Indicators

	
Device is powered on.	Device is powered off.

The light pattern provides an indication of the machine's state so that you can give commands using the power button.

	Ignited	**Bluetooth Status**	**Charging**
OFF/2 Pulses/OFF/2 Pulses	Yes	Discoverable	No
OFF/ON/OFF/ON*	No	Discoverable	No
Steady On	Yes	Connected	No
ON/2 Pulses/ON/2 Pulses	No	Connected	No
Breathing*	No	Both	Yes
No Light	Unit is Off.		
Rapid Fast blink then OFF	Unit has detected a battery at <10% of charge and automatically powered down. In order to restart, you will have to attach the charger for at least 90 minutes before powering back on.		

*Once the battery is fully charged, but connected to a charger then it will cycle between OFF/ON/OFF/ON and Breathing. This is because once the battery is fully charged it stops charging (even though it is still plugged in) and the light goes OFF/ON/OFF/ON until the battery is depleted a minimal amount and the charging process re-begins and the light starts to Breath.

Filling the phx42 with Hydrogen

Gases are typically stored under pressure in metal cylinders. Cylinders are designed to withstand high pressures. Improper handling and use of compressed gases can result in devastating consequences. Be sure to follow all safety guidelines outlined by your facility.

1. *Remove* the **H2 quick-fill cover** (LDAR#42908).

2. *Make sure* of the following:
   (a) The **hydrogen cylinder** being used to fill the **phx42** has a regulator in place.
   (b) *Turn* the regulator to counter-clockwise if pressure has been bled.
   (c) Verify that there is no dust or debris in the **Hydrogen (H_2) fill port**.
   (d) Verify that there is no dust or debris in the **Hydrogen (H_2) fill adapter**.
   (e) *Verify* the arrow on red handle is pointing to the breather side of the fill valve.
   (f) *Gauge* nearest the cylinder is reading ~1800 psi. If not, *adjust* regulator.
   (g) If pressure has bled off the **fill adapter**, *turn* the red handle 180 degrees for 2 seconds to bleed any air from the system before connecting to the phx42.

3. *Power on* the **phx42**. Sleep mode, connected, disconnected, or ignited are all ok. In some cases, a flameout will occur. This is normal.
4. *Connect* the **H_2 fill adapter** to the **H_2 fill port**, then *verify* the connection by slightly *pulling* on the 3-way valve.

5. *Confirm* that the **H_2 fill adapter** is firmly seated on the **H_2 fill port**.
6. *Turn* the red handle 180° to open valve. Arrow should point to the fill hose.
7. *Wait* for 10 seconds after the needle on the gauge stops moving.
8. *Turn* the handle back 180° to close valve.
   There will be a slight hiss from the release of pressure.
9. *Pull* on the collar of the **H_2 fill adapter** to release it.
10. *Twist* the **H_2 quick-fill cover** onto the **H_2 fill port**.
11. *Close* bottle. There is no need to *bleed* pressure off the **H_2 fill Adapter**.

REMINDER: The **phx42** MUST have the **H_2 quick-fill cover** in place at all times unless filling.

A very small amount of O-ring grease should be applied to the phx42 side of the quick connect weekly. Apply as little as possible.

Your **phx42** is now filled with hydrogen, and while it has been designed to minimize possible leaks, you should handle and store it with caution.

TECH TIPS:

1. *Maintain* a constant pressure range of 400 – 1800 psi. If the hydrogen is allowed to drop below 400 psi, you may have to follow the "Receiving After Shipping" procedure below.
2. *Fill* your cylinder at end-of-day, this accomplishes several things:
    a. Analyzer will have enough hydrogen for end of day drift.
    b. Being full overnight allows the calibrating tech to see if the pressure is stable or dropping (leak test).
    c. Motor needle valve has time to stabilize with a full cylinder.
3. Many successful users have adopted a 2-fill practice: Mid-day and End of day.
4. If the **H_2 Quick Fill Cover** pops off, it's likely that there's a hydrogen leak. Report an issue to LDARtools Technical Support and send the Log files.

Receiving After Shipping

The battery and the hydrogen cylinder are drained for shipping. Special charging and fill procedures are required.

Charge the battery:

1. *PULL* **Charging Port Cover** (LDAR# 42013) to access the charging port. *Twisting/turning* the Cover to remove will damage the Tether. It does "click" into the **Charging Port** so some effort will be required to remove the Charging Port Cover.
2. *Align* the red lines on the **phx42 charger** and the **charger jack**. *Push* gently and you will feel a click.
3. *Turn on* **phx42**, if not already on. The power button should have a light on*.
4. If the pumps are still running, *tap* the power button four times to put the machine in Sleep Mode.

    If battery power is sufficient, power light on the phx42 will begin to breathe/pulse.

***REMINDER:** If charging a **phx42** with a fully depleted battery, the power button may blink rapidly or not respond at all. Leave the **phx42** powered off for a minimum of 90 minutes while connected to charger. Then repeat steps 3 and 4.

Filling Empty cylinder with Hydrogen

The motor needle valve for the hydrogen cylinder will need some time to adjust from an empty to a full cylinder. Follow the standard "Filling the phx42 with Hydrogen" procedure, with the following exceptions:

- After step 6 (in the fill procedure above) instead of counting to 10, watch the gauge near the hydrogen fill cylinder and stop the flow when the gauge is reading between 900 – 1000 psi. Turn the handle back 180° to close valve.
- *Pull* on the collar of the **H_2 fill adapter** to release it.
- Wait *4 minutes for the* **motor needle valve** *to adjust*.
- *Confirm* that the **H_2 fill adapter** is firmly seated on the **H_2 fill port**.
- *Turn* the red handle 180° to open valve. Arrow should point to the fill hose.
- *Wait* for 10 seconds after the needle on the gauge stops moving (at 1800 psi).
- *Turn* the handle back 180° to close valve.
    - There will be a slight hiss from the release of pressure.
- *Pull* on the collar of the **H_2 fill adapter** to release it.
- *Twist* the **H_2 quick-fill cover** onto the **H_2 fill port**.
- *Close* bottle. There is no need to bleed pressure off the **H_2 fill Adapter**.

TECH TIP: 2-3 ignition attempts may be required. Pressure Stabilization messages are normal. Wait 4 minutes between each ignition attempt. If **Ignition Failure** continues, perform a self-check, and submit a failure with comments to LDARtools Support Team.

Charging the phx42

1. *PULL* **Charging Port Cover** (LDAR# 42013) to access the charging port. *Twisting/turning* the Cover to remove will damage the tether. It does "click" into the **charging port** so some effort will be required to remove the Cover.

   TECH TIP: It is important to grasp the cable between the Cover and the crimp when removing the charging port cover. This accomplishes two things:

   - Protects the cable crimp.
   - Ensures that you're pulling the Cover out straight instead of at an angle.

2. *Align* the red lines on the **phx42 charger** and the **charger jack**. *Push* gently and you will feel a click.

3. *Turn on* **phx42**, if not already on. The power button should have a light on*. If the pumps are still running, *tap* the power button four times to put the machine in Sleep Mode.

   *If battery power is sufficient, power light on the **phx42** will begin to breathe/pulse.

TECH TIP: It is best to *leave* the charger connected during calibrations (daily, PreCal, or drift) for best battery performance.

REMINDERS:

1. The C*harging Port Cover* MUST be in place while using the **phx42** in a hazardous area.

2. If charging a **phx42** with a fully depleted battery, the power button may blink rapidly or not respond at all. *Leave* the **phx42** powered off for a minimum of 90 minutes while connected to charger. Then repeat step 3.

Replacing the Probe Tip Filter

REMINDERS:

1. A **probe tip filter** should be in place at ALL times while the *phx42* pump(s) are running.

When prompted to change the filter by the handheld or before unit start up:

1. *Remov*e the dirty **filter**, and then attach the **probe tip** to a clean **filter**. **Probe Filter-Double Thread** (LDAR# 25).

2. *Re-ignite*.

FAQs while Monitoring

FAQ	**How long should it take to recover from a high PPM to background?** *It is impossible to give a specific answer without knowing what type of chemical and for what length of time the phx42 was exposed. If you are concerned about the recovery time, complete a Self-check and Gas Check using the 42 app and submit an issue. Comment: "Slow Recovery Time".*
	How can I Ignite the phx42 without removing it from my backpack? *If unable to "ignite" the phx42 from your monitoring software, you can use the "triple tap" method without removing the unit from your backpack. You will know the unit is ignited when you see a PPM reading on the monitoring screen.*
	What should I do with my phx42 when I come in for lunch? 1. *Fill H2* 2. *Leave running* 3. *Plug it in*

Section 2

phx42 App

phx42 App

1. The 42App can be downloaded from Google Play or obtained from your site IT department.

Starting the phx42 App

1. *Install* the phx42 application on an Android device with web access.
2. *Open* the phx42 application on your device.
3. *Tap* the phx42 device you want to connect to, then *tap* **Connect to phx42**.

   You will be directed to the phx42 screen once connection is complete.

What's in the phx42 App

The home screen provides information on the **phx42** device:

- The PPM reading
- The LPH2 (Low Pressure Hydrogen)
- H2 (Hydrogen Tank Pressure)
- The battery status
- The battery charge percentage
- The **Ignite** button

Menu Options on phx42 App

1. *Tap* **Menu.**
2. *Tap* any of the following:
   - **Calibrate:** Calibrate manually.
   - **Self-check:** Do a self-check on your **phx42**.
     (You must have a Support Login to submit an issue)
   - **Device Details:** Provides more details about your device. Code of the day or login required.
     Request the code of the day by emailing support@ldartools.com.
   - **Update Firmware:** Update the **phx42**'s firmware.
   - **Prepare to Ship:** Drains battery and Hydrogen supply.
   - **Survey Components**:
   - **Settings**:
   - **Report App Issue**:
   - **Disconnect:** Disconnect from the **phx42**.
   - **About:**

Firmware Updates

1. *Launch* the phx42 app on the Android handheld.
2. *Select* the phx42 from the list.
3. *Tap* **Connect**.
   REMINDER: *Tap* **Pair** if necessary.
4. From the menu, *tap* **Update Firmware**.
5. *Select* the version of the update.
6. *Tap* **Update**.
   Once complete, the 42App will automatically disconnect from phx42.
7. *Power cycle* the phx42.
8. *Refresh* the 42 App by closing and opening it.
9. *Select* the phx42 from the list
10. *Tap* **Connect**.
11. From the menu, *tap* **About**.
12. *Confirm* the firmware version is correct.
13. *Tap* **Done**.

FAQ	**How will I know when a new version of Firmware is available?** *New versions of the firmware will be available on the "Firmware" tab of the 42App. It is not necessary to update your firmware unless instructed to do so by LDARtools support. Updating firmware will clear calibration records for that day.*
	Do I need to calibrate my phx42 after I update the firmware? *Yes. Loading new firmware will clear your calibration records. Avoid updating the firmware unless you have already pulled your monitoring data and performed drifts for the day.*

Prepare to Ship

1. *Launch* the phx42 app on the Android handheld.
2. *Select* the phx42 from the list.
3. *Tap* **Connect**.
   REMINDER: *Tap* **Pair** if necessary.
4. From the menu, *tap* **Prepare to Ship**.
5. Select Domestic or International.
6. Tap **Start**.

TECH TIP: *Most units will take from 30 minutes to 2 hours. Some units could take up to 5 hours. Monitor the status bars to confirm status. Report any problems by running a self-check.*

Setting a PPM Alarm

1. *Launch* the phx42 app on the Android handheld.
2. *Select* the phx42 from the list.
3. *Tap* **Connect**.
   REMINDER: Tap **Pair** if necessary.
4. *Tap* the **Menu** in the top-left corner of the screen.
5. *Tap* **Settings**.
6. *Tap* the **PPM Alarm** field.
7. *Enter* the PPM Alarm value you want to set.
8. *Tap* **Save**.

Igniting the phx42

1. *Tap* **Ignite**.

TECH TIP: After you have filled the unit with hydrogen it may take several attempts to ignite.. This is because the hydrogen pressure has to stabilize. The best approach is to wait 4 minutes between each ignition attempt. If **Ignition Failure** continues after 3 tries, perform a self-check, and submit a failure with comments to LDARtools Support Team.

More about the 42App

A word about the Device Details

1. The Device Details screen shows how the machine is operating.
2. This DOES NOT indicate what the values should be or whether or not the values are in nominal ranges.
3. OTHER VALUES ARE INDIVIDUALLY SET FOR EACH, UNIQUE phx42 AND WILL THEREFORE BE DIFFERENT!!!*
4. A constant history of these values is maintained for LDARtools Tech Support to facilitate troubleshooting.

5. **Other than that, they are not useful to you. You are likely to distract yourself from more important endeavors by trying to analyze or compare these values.**

**In order to get the optimal arrangement of fuel, air, and sample, we have developed a way to fine tune each individual analyzer to get the most consistent results. In this way, machine specific values have been established and are available to update your unit whenever it is connected to the 42App and the Internet.*

A Word about the self-check

1. Each parameter is checked either to a universal standard for all **phx42s** OR to the set of specific values that have been defined for the specific unit. These values may be different from one unit to the next.

2. We are displaying PASSED/FAILED/COMPLETE but we are storing the actual values for troubleshooting purposes.

3. All of the following parameters (and more) are evaluated during self-check:

    - Glow Disk
    - Solenoid
    - HPH2
    - Temperatures
    - LPH2 Stabilization
    - Sample pressure
    - Sample PPL
    - Probe check
    - Combustion PPL
    - Combustion pressure
    - Pico Amps
    - Other failed parameters may show on-screen as “phx42 error”

4. Once you have performed a self-check in the 42App, then any non-acceptable result for any analyzer are flagged and you are given an opportunity to comment and submit to the LDAR Support Portal.

5. Passing self-checks are followed by a prompt to complete a “Gas Check”, this is a Diagnostic tool that you will only use if instructed to by LDARtools support.

Manual Calibration

The phx42 should not be calibrated with On-Demand regulators as they do not consistently simulate the monitoring process. The vacuum required to open and hold open the valve can and does affect calibration accuracy.

Before you begin manually calibrating with gas bags, please take note of these precautions to ensure the most accurate calibration possible:

- LDARtools recommends using a SpanBox.
- When filling bags, do not fill them completely. Doing so is not only bad for the bag, it can also cause calibration issues.
- Make sure the bag is not pinched or pressed during calibration.
- Make sure the bag valve is fully open to ensure proper flow.
- Always start with the lower concentration and work your way up to the highest concentration when calibrating, confirming, or drifting.
- Always calibrate a 0 PPM and a concentration above 2 PPM.
- Calibration overwrites all prior calibrations. Back-to-back calibrations with different probes does nothing but overwrite the previous calibration.

1. Install a new **filter**.
2. Run the self-check on the 42App before starting calibrations.
3. Check Probe flow using **Flow Meter Assembly (phx42) -** LDAR# 4024 (0.2-0.3 liters/min).
4. Tap the menu button.
5. Tap Calibrate.
6. Tap **Cal All**.
7. Type the actual PPM for the cylinder onto the PPM field.
8. Apply gas (begin with 0 PPM) and then tap **Generate**.
9. Let the calibration run.

   The **phx42** will sample the gas, then display the "Calibration Complete" message.
10. Repeat Steps 7-9 until all the Calibration Spans have been added, then tap **Done.**

TECH TIP: If you experience high Response Times, do a self-check.

TECH TIP 2: Best practice would be to add "Calibrate filter" step to the end of your daily calibration form.

FAQ	**What do I do about slow recovery during Daily Calibration?** *If, during the confirmation phase after Daily Calibration, it takes more 2 minutes to recover to the 2 PPM level, you can recalibrate to Zero by clicking the **Cal Zero** button in the 42App.*
	I have to use On-Demand Regulators, is there anything I can do?

	If you must use On-Demands, apply the gas 20 seconds before starting the calibration. Even if you are able to calibrate, you will experience drift issues.

Creating Daily Calibration Reports

The **phx42** does not automatically create daily calibration reports when the device is manually calibrated.

For assistance upgrading to a **Spanbox5** for the **phx42** see LDARtools.com.

Filter Detection

Filter detection is an optional feature that can be enabled by contacting support@ldartools.com.

To enable (first-time):	Run a self-check through the 42App and follow the on-screen prompts.
Daily Routine	After the PPM calibration but within 30 minutes: a) *Remove* the **probe filter**. b) *Wait* 10 seconds (the pumps will shut off). c) *Replace* the same **probe filter**. d) *Reignite*.
Non-routine	**For Monitoring Technicians (When using LTIMobile2 or Freedom).** **Er: Code 24** 1. *Remove* the **probe filter**. 2. This will shut down the phx42 and you will receive an "Feels like you removed my filter" message. 3. *Replace* the same **probe filter** 4. *Reignite*.
"Feels like filter is removed" Error BUT you did not remove the filter.	1. *Add* a **Second (ADDITIONAL) filter** to your probe tip. 2. *Reignite*. Confirm ignition. 3. *Remove* **BOTH filters** from your probe tip. This will shut down the phx42 and you will receive an "Feels like you removed my filter" message.

	4. *Add* **ONE filter** to your probe tip. 5. *Reignite.*

Please Avoid removing either the probe tip filter or the probe hose (from the phx42 probe inlet) **and reinstalling it within 2 seconds.** If you do, you will get a "Feels like filter is removed" Error. Follow the steps above.

FAQ	**Do I have to calibrate the filter after the ppm calibration if I calibrated the filter after self-check?** *Yes.*
	Will I always be prompted to calibrate the filter during self-check? *No, you will only be prompted to calibrate the filter the first day, the routine is to calibrate the filter within 30 minutes of completing ppm calibration. You will need to do this without prompting.*
	Why am I seeing code 24 errors before I've completed my ppm calibration for the day? *If the filter was not calibrated after the most recent ppm calibration then you will see **"Er: code 24"** immediately, even if the ppm calibration hasn't been completed for the current day.*

Application Error Codes

If the application you are using with the **phx42** gives an error code, this is what your machine is trying to say:

Code	Description
5	Too many calibration points.
16	My flame is out.
18	This application failed to set the date and time. I really like to know at least WHEN I am!
19	This calibration cannot be deleted. Contact LDARtools Support.
20	This calibration cannot be possible. I'm reading this signal lower than the last gas you applied.
21	No can do. I need some warming up first. Depending on your application you may need to warm me up for longer than this short requirement.
22	I can't run on H2 this low!
24	Remove probe tip filter, wait 5 seconds, then reinstall the same filter.

FAQ	**What should I do if I receive an Intake Overpressure Error, but my filter has not been removed?** If you receive a FALSE intake overpressure error: 6. *Add* a **Second filter** to your probe tip. 7. *Reignite* using your monitoring software. 8. Once successfully ignited, *remove* **ALL filters** from your probe tip. This will put the phx42 into sleep mode and you will receive an "Intake Overpressure" message. 9. *Add* **one filter** to your probe tip. 10. *Reignite* using your monitoring software.

Section 3

Level 1 Repair Procedures

Before You Begin

Before any repairs are performed on-site, you must fill out the Report an Issue form on the LDARtools website or report the issue through the phx42 app (preferred). You will receive instructions and procedures from the support team.

Remember, to protect the intrinsic safety and reliability of the **phx42 analyzer**, ONLY certified personnel may perform the repairs. Any repairs that cannot be performed based on the procedures provided by LDARtools must be authorized in writing by LDARtools management.

Make sure to complete any required hazard analysis as appropriate or required by your facility.

REMINDER: On-site Level One repairs are not required. It is a privilege enjoyed by some LDARtools customers where circumstances allow. If unable to meet the requirements below Level One Support will not be provided.

Requirements of Level One Certification

- Web access (ldartools.com, https://ldartools.agiloft.com/ and all subpages)
- Company email access
- Phone Access
- Spare Parts inventory (listed below)
- Tool Kit (listed below)
- Android Device with web access. LDARtools may be able to provide cellular web access where coverage allows.
- Passed the phx42 Level 1 Certification Exam or Refresher in the last 90 days.
- Reviewed and completed the phx42 Level 1 pledge.

phx42 Level One Repair Tech Pledge

- I will **report an issue** before doing any repair or replacement inside a phx42 case.
- I will **report issues using an Android with the phx42 app on an internet connection.**
- I understand that as soon as a phx42 is powered on a log file is being recorded. The machine does not need to do anything other than power on.
- I will never turn on or run a phx42 pump without a probe filter in place.
- I will not use any part in or on a phx42 that was not provided by LDARtools.
- I will never use electrical tape, duct tape, soldering irons, wire crimps, or anything else not provided by LDARtools to do a repair.
- I will not perform repairs that are not authorized by LDARtools.
- I will not do any of the following until I have **reported an issue:**
    - Change a battery.
    - Change a pump.
    - Change a glow plug.
    - Anything else that involves opening the phx42 case.
- I will maintain an inventory of at least:
    - 2 QTY – Sample Pump
    - 1 QTY – Combustion Pump
    - 2 QTY – Glow Disk Assembly
    - 1 QTY - O-Ring Grease for the H2 Fill Adapter
    - 1 QTY – Scrubber Media Kit
- I will perform the phx42 Self-Check before calibration each day.
- I understand that failure to perform the Self-Check will greatly increase in field equipment failures.
- I will immediately discard/recycle or return to LDARtools replaced parts.
- I understand that I am working on equipment that is full of Hydrogen and strapped to a person's back.
- I understand that failure to meet the requirements of this pledge will void my phx42 Level 1 Certification and may require the recertification of the phx42(s) at my site at my employers' expense.
- I will report my own issues and check my email for updates.

How to Take the Level One Certification Test

In order to complete on-site troubleshooting and repairs we require the Technician to become Level One Certified.

Level One Certification is valid for 90-Days. If your certification has lapsed, please log in and take the refresher test to ensure your certification is current.

To register on our Training website (Litmos) and complete the phx42 Level 1 Certification exam:

1. *Go* to https://ldartools.litmos.com/self-signup/ USE CODE: PHX42 LVL1
2. *Follow* the instructions on the screen to register for the test.
   You will receive an email with a link to the course.
3. *Go* to your email, click the link, complete the relevant fields (First Name, Last Name, Email, Password, and Company) and then click **Continue**.
4. *Complete* the test by following the instructions on the screen.

If you have any questions, email login@ldartools.com.

REMINDER: We recommend completing the test on your computer. Smartphones (especially older ones) may experience long load times without a strong and stable internet connection.

Required Spare Parts

1. **Sample Pump** LDAR# 42490 – 2 QTY
2. **Comb. Pump** LDAR# 42491 – 1 QTY
3. **Glow Disk Assembly** - 2 QTY
4. **Scrubber Media Kit** – 1 QTY

No. of **phx42** on site	No. of recommended spare parts kits
1-5	1 kit
10+	2 kits

Tool Kit Inventory

phx42 Tool Kit LDAR#4203 – 1QTY

a. **Tool Bag** LDAR#4215 – 1QTY
b. **Flame Arrestor Wrench** LDAR#42191 – 1QTY
c. **Angled Wire Cutters** LDAR#1741 – 1QTY
d. **Glow Disk installation tool and case**
e. **0.7 mm Hex Driver** LDAR#4216 – 1QTY
f. **Fixed-Tip Retaining-Ring Pliers** LDAR#4217 – 1QTY
g. **Wiha Driver** LDAR#965 – 1QTY
h. **Scrubber Spanner Wrench** LDAR#4219 – 1QTY
i. **Philips Screwdriver Bit** LDAR#4218 – 1QTY
j. **T25 Security Torque Bit** LDAR#964 – 1QTY

Additional tools: **Flow Meter Assembly** (phx42) - LDAR# 4024

Weekly Probe Integrity Inspection

1. *Ignite* the phx42.
2. *Apply* Zero Gas.
3. *Use* one freshly opened Alcohol-based lens cleaning wipe per **probe**.
4. *Run* the wipe along the length of the **probe hose** and at the joints of your **probe** while watching the PDA connected to the **phx42**.

   If there is a leak, it will be drawn through the breach, into the **phx42** and will register a PPM reading within seconds.

5. If you detect a PPM deflection of >2PPM, *report an issue*.

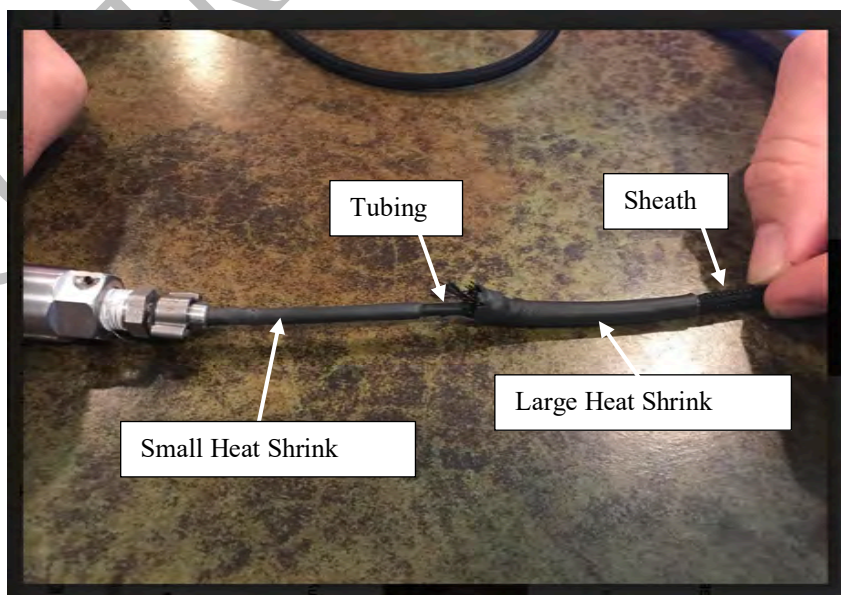
REMINDER: The length of time the phx42 will take to register a deflection will correspond to the response time of the machine. If inspecting an extension probe, you must slow down to accommodate the extended response time (minimum of 1 second per foot of probe tubing +5 seconds).

Probe Hose Construction

The Probe Hose connections have three layers of protection for the Tubing that is conveying the sample. A tear in the Sheathing or either layer of Heat Shrink may not have compromised the Tubing.

Use the Probe Integrity Inspection above to determine the condition of the Tubing.

REMINDER: Repairing visible damage to the heat shrink will not address a leak in the Tubing, because the sheathing is permeable.



Probe Repair Procedure

Tools and Parts

Probe Repair Tool Kit (LDAR#4040):

Additional recommended supplies:

Snoop Liquid Leak Detector or other Non-VOC material for lubrication of tubing.

Picture ID	Part Name	LDAR Part #
A	Rod for threading Tubing through Sheath	42099
B	Heat Gun	4231
C	Angled High Leverage Cutters	4234
D	Pinch Clamp Pliers	4021
E	Angled Wire Cutters*	1741

*Included in phx42 level 1 tool kit LDAR# 4203.

Probe Repair Kit (LDAR#4020)

Picture ID	Part	LDAR Part #
A	Large Heat Shrink (2 – 2.5" Pieces)	42094
B	Small Pinch Clamp	42091
C	Large Pinch Clamp	42093
D	Small Heat Shrink	42087
E	Sheath	42082
F	Tubing	42083
Not Shown	White Teflon Collar	42420
Not Shown	Male Luer to Bulkhead	42084

Disassembly:

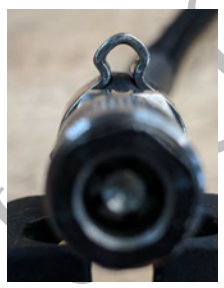
Probe Clamp Removal:

1. *Grasp* the **Large Pinch Clamp (LDAR#42093)** on one "ear" with the **Pinch Clamp Pliers (LDAR#4021)**.

TECH TIP: Use the front edge of the **Pinch Clamp Pliers** for all steps in this procedure. We will never use the side face.

2. *Grasp* the other "ear" of the **Pinch clamp** with the **Angled High Leverage Cutters (LDAR#4234)**.

3. *Squeeze* the **Angled High Leverage Cutters** on the "ear" to get it ready for cutting.



Before squeezing with **Angled High Leverage Cutters**

After squeezing with **Angled High Leverage Cutters**

4. Using the very end of the **Angled High Leverage Cutters**, make a *series of tiny cuts* along the length of the ear until it is completely cut off.




5. Pull the cut clamp off with the **Pinch Clamp Plier** by pulling on the remaining "ear" of the clamp that you were already gripping.

TECH TIP: Be aware of the barb extending into the tubing. You do not want to pinch or bend the barb.

6. Repeat this process for the **Small Pinch Clamp (LDAR#42091)** on the handle side of the Probe Assembly.


7. Once both Pinch Clamps are removed, pull off the outer **Large heat shrink (LDAR#42094)** and **Sheath (LDAR#42082)** using the **Angled Wire Cutters (LDAR#1741)** if necessary.


8. *Pull* the **Tubing (LDAR#42083)** off of the barb on the Quick Disconnect end.

9. On the base of the probe, *pull* the **Tubing (LDAR#42083)** out and *cut* it off above the **Heat Shrink**.

10. *Unthread* the **Luer lock** fitting at the tip of the **probe**. Try first with fingers alone. If this does not work, gently grip the fitting in the notch with the crimping pliers and loosen. Be careful to avoid the central stem of the fitting since this is the sealing surface.

11. *Pull* the Tubing off of the barb of the fitting.

12. *Discard* the used **Tubing**, **Sheath**, **Heat Shrink,** and **Pinch Clamps**.

Probe Inspection (part 1):

At this point you should be left with the three fittings that make up the Probe Assembly:

Picture ID	Part	LDAR Part #
A	Handle	42081
B	Quick Disconnect and 10-32 to 1/16ID Barb	42092/42916

Inspect the remaining parts:

1. *Inspect* **Quick Disconnect (LDAR#42092)** for blockage.
2. If damaged, *report* an issue.

Probe Reassembly:

1. *Lubricate* **Male Luer to Bulkhead to 0.125" O.D. barb (LDAR #42084)** with **Snoop** or equivalent. **Do not use a lubricating with any VOC content. (If you are not sure, test a sample of what you want to use with a phx42. That's what it's for!)**

2. *Push* **Tubing (LDAR #42083)** onto the **barb side of the Male Luer (LDAR #42084)**, stopping after the Tubing has moved over the first ridge.

3. *Feed* the other end of the **tubing** all the way through the center of the **Handle (LDAR #42081)** until you can *thread* the **Male Luer bulkhead** into the **Handle**.

4. *Tighten* the **Male Luer Bulkhead** into the **Handle** first with your fingers and then giving it a last gentle tightening with the **Clamping Pliers** by gripping the fitting in the slot with the flats of the pliers. Do not overtighten, doing so can mar or damage the fitting.

5. Slide 2 inches of the **Small Heat Shrink (LDAR #42087) over the Tubing** until about 1 inch is inside of the **Handle** and about 1 inch is still visible.

6. Use the **Heat Gun** to *shrink* the **Heat Shrink** to the **Tubing** (this takes about 30-60 seconds).

TECH TIPS:

- Hold the heat gun about ½" from the surface of the heat shrink.
- Start at the edge of the heat shrink on Tubing side and work toward the applicable metal fitting, rotating the tubing so that all sides are exposed to the heat gun.
- You will be finished when the heat shrink has grown smaller, starts to shine, and you have a small excretion of adhesive at the Tubing side that is glistening.

7. Use the **Rod (LDAR#42099)** provided with tool kit to feed the **Tubing (LDAR#42083)** through the **Sheath (LDAR #42082)**.

8. *Slide* the **Sheath** over the **Barb** at the base of the probe **Handle**, far enough to cover the barb but not so far that it has errant strands sticking out once the heat shrink is in place.

   TECH TIP: You must have some fraying to allow the **Sheath** to fit over the barb.
9. *Insert* 2 ½ inches of **Large Heat Shrink (LDAR #42094)** over the **Sheath** covered barb, then *heat* it with the **Heat Gun** following the "Heat Gun Tips" outlined above.

   REMINDER: It is important to use the heat gun provided with the Probe Repair Tool Kit. Use of a different tool may result in the melting of the **Sheath** material.

10. *Slide* the **Small Pinch Clamp (LDAR #42091)** over the **Heat Shrink** then *crimp* in place using the **Crimping Pliers**. *Lightly crimp* one side and then the other. Once they are crimped lightly, *crimp each side tightly*.

11. Starting at the **Handle** slowly *work* the **Sheath** down toward the **Quick Disconnect** end of the probe to ensure that there are no kinks/bunching.

    TECH TIP: The **Sheath** and **Tubing** should come out even with frayed ends sticking out.

12. *Slide* **Large Pinch Clamp (LDAR #42093)** over the **Sheathing**.

13. *Slide* 2 ½ inches of **Large Heat Shrink (LDAR #42094)** over the **Sheathing**, according the photo.

14. *Slide* **the white Collar (LDAR#42420)** over the tubing and away from the edge.

15. *Slide* the Tubing onto the **1/16" barb side of the Quick Disconnect.** *Slide* the **Collar** forward onto the **barb** until it and the **Tubing** are flush with the base of the **Quick Connect.**


Tech Tip: Do not try to fully seat the **Tubing** onto the barb. The **Collar** will push the tubing the rest of the way onto the barb. If the tubing cannot move forward you will create a bubble.

16. *Slide* the **Sheath** over the threaded portion of the **Quick Disconnect**, again making sure it is on far enough that it will be covered by the heat shrink, but not so far that there are errant strands sticking out from under the Heat Shrink.

    TECH TIP: You want strands extending all the way to the top of the threaded section. Trim off any that extend past the threaded section.

17. *Slide* the **Heat Shrink** over the barb, then shrink it down over the **Sheath** and the **Quick Disconnect** with the **Heat Gun**, follow "Heat Gun Tips" above and work from the **Tubing** side toward the **Quick Disconnect**.

18. *Slide* the **Large Pinch Clamp (LDAR#42093)** over the **Heat Shrink** covered **Quick Disconnect** and *tighten* it the same way you tightened the **Small Pinch Clamp (LDAR#42091)** in step 10 above.

Probe Inspection (Part 2):

13. To ensure that the probe repair has been successful, follow the "Weekly Probe Integrity Inspection" procedure outlined in this manual.

Removing a Broken Probe Tip Filter

If the plastic filter on the probe broke off, the best way to get the filter base out is to use the **Fixed-Tip Retaining-Ring Pliers** (LDAR#4217) that are in the phx42 Level One Tool Kit.

1. Carefully use the tip of the pliers to grab the outside of the plastic.

2. Push the ends of the pliers firmly into place.
3. Spin the plastic counter-clockwise to screw it out of the filter base.

REMINDER: Make sure not to touch the center tapered post. If this portion gets scratched or marred, then it will need to be replaced.

Identify phx42 Parts

A. **Pumps**

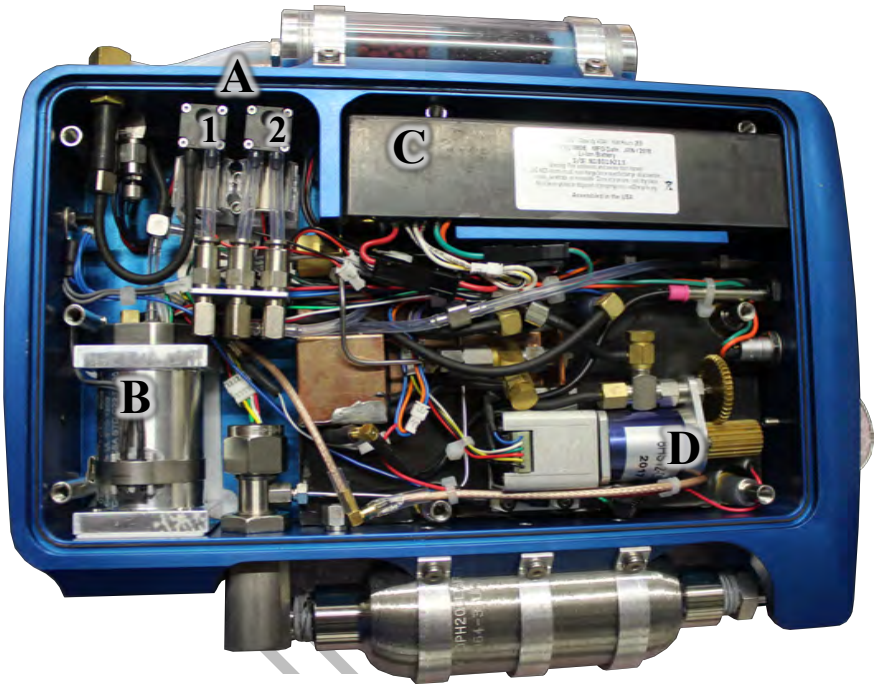
   1) **Combustion**

   2) **Sample**

B. **FID Housing**

C. **Battery**

D. **Motorized Needle Valve**



Removing the phx42 Lid

1. *Place* the **phx42** in Sleep Mode.
2. *Report an Issue* and wait to be instructed by support staff.
3. *Hold* the bottom binding post(s) with a **T25 Security Torque Bit** or **Philips screwdriver**. Do not allow the binding posts to turn.
4. *Unscrew* the eight screws from the top [**6 short enclosure screws and 2 long enclosure screws**] on the phx42's **enclosure lid** with the provided screwdriver.
5. *Lift* the **enclosure lid** once the screws are removed.

TECH TIP: Binding posts (from enclosure base) are held in place by clips. Do not attempt to remove. If the binding posts fall out you may have popped the clip off by allowing the binding post to spin.

Reinstalling the phx42 Lid

1. *Place* the **phx42** in Sleep Mode.
2. *Replace* **enclosure lid**.
3. *Finger tighten* the two longer screws in the center hole above and below the phx42 logo.
4. *Finger tighten* remaining **enclosure screws**.
5. *Hold* the bottom binding post(s) with a **T25 Security Torque Bit** or **Philips screwdriver**. Do not allow the binding posts to turn.
6. *Use* Screwdriver to tighten until resistance is felt. Don't over tighten as it will cause damage.

TECH TIP: Screws should line up and screw together with just fingers. *Take* your time and *finger tighten* before using tools. If binding occurs, *stop* and *report an issue*.

FAQ	**Why can't I use a Power Driver?** *Do not use any tools for phx42 repairs that have not been authorized by LDARtools support.*

Replacing the Scrubber Media

Scrubber identified under the "external parts" section of the manual contains **scrubber media** consisting of:

- **Poly filter disk x 3**
- **Activated Charcoal**
- **Purafil select**

The purpose of this media is to provide air filtration. It's connected to a 2nd **pump** inside the machine and it allows clean air to mix with the sample air so higher ppm readings can be measured.

As it filters air the "**Purafil**" portion turns from fuchsia to white. Anything in between is fine. The rate of the color change is determined by the amount of filtering that is happening. If clean air is being drawn through the filter, it will last for months. If the **filter** is working hard it could last days or weeks.

When the **Purafil select**'s color turns white, it is time to replace scrubber media. If you do not change the scrubber media, you might experience odd calibration issues.

1. *Contact* LDARtools Technical Support before starting the procedure.
2. *Place* the **phx42** in Sleep Mode.
3. *Use* the **Scrubber Spanner Wrench** to loosen the **Scrubber Chamber Cap**. Once loosened, you should be able to unscrew it by hand.

Step 3

4. *Remove* the **first poly filter disk** (LDAR#42416).
5. *Dump* the **activated charcoal** (LDAR#42414) out of the **scrubber**.

Step 5

6. *Remove* the **second poly filter disk**.
7. *Dump* the **Purafil select** (LDAR#42415) out of the **scrubber**.
8. *Leave* the **third poly filter disk** in the bottom of the **scrubber chamber**.

Step 7

TECH TIP: Attempting to remove the 3rd filter disk may result in debris being pulled into your analyzer.

9. *Discard* the used **Poly filter disks**, **charcoal** and **Purafil Select***.
10. *Pour* in the new **Purafil Select**.
11. *Insert* one **poly filter disk** and tamp carefully against the **Purafil Select**.
12. *Pour* in the new **activated charcoal**.
13. *Insert* the last **poly filter disk**.
14. *Insert* and tighten the **Scrubber Chamber Cap** just finger tight and until no threads are visible.

***Purafil Select** should be disposed of according to local, state, and federal guidelines.

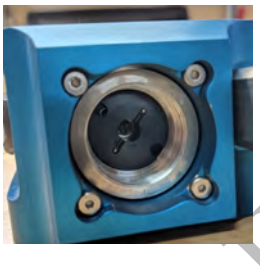
Glow Disk Repair Procedure

Glow Disk Installation:

1. *Place* the **phx42** in Sleep Mode.

2. *Loosen*, but do not remove, the **set screw** on the face of the **Flame Arrestor Cap** with the **0.7 mm hex driver**.

3. *Use* the **Flame Arrestor Wrench** to remove the **Flame Arrestor Cap**.

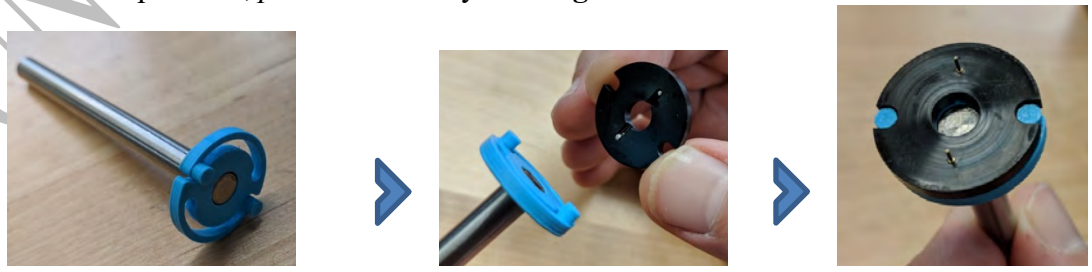


4. With the **Fixed-Tip Retaining-Ring Pliers**, *reach* into the **FID** and *grasp* the **glow disk** by the two notches on its edge.

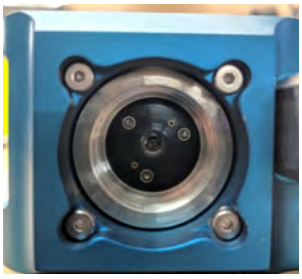
5. *Pull* the **glow disk** straight out to remove it from the **flame arrestor housing**.

REMINDER: Due to the VERY sensitive nature of the **glow disk** and the wire across the surface, this is a very good opportunity to practice using the tools to do steps 5-8 using the old **glow disk** without fear of damaging the wire.

6. *Making sure* not to touch the delicate wire on the new **glow disk** and holding the disk with minimum pressure, *place* it carefully on the **glow disk tool**.



7. *Look* inside the **FID housing** to check the orientation of the sockets that the **glow disk** will plug into.



TECH TIP: *Practice* using the tool to remove and replace the **glow disk** using the broken part prior to installing the new one.

8. Using one of the two notches on the **glow disk** that is perpendicular to the orientation of the pins to help align it for installation, slowly and carefully *insert* the **glow disk installation tool** into the **FID housing**.

9. If necessary, slightly *rotate* the tool until the pins line up. Once they do, lightly *push* the **glow disk** into position.

10. After the installation, *pull* the **glow disk installation** tool straight out.

    It will automatically release from the **glow disk**.

11. Start *threading* in the flame arrestor by hand, then *tighten* it all the way using the **flame arrestor wrench**.

12. Tighten the set screw with the **0.7 mm hex driver**.

REMINDER: Do not *over tighten* to prevent stripping out the screw socket.

TECH TIP: If resistance is met before completely installed, *stop* immediately and *report an issue*. Final tightening force should be like a water hose spigot.

Opening & Closing the Flame Arrestor Assembly

REMINDER: Never remove the **flame arrestor** unless instructed to by LDARtools Technical Support within the context of a support case. Damage to the **glow disk** is likely if not certain.

Replacing the Battery

1. *Report an Issue*. **Failure to do so voids warranty.**
2. *Wait* to be instructed by LDARtools Technical Support to change the **battery** (LDAR# 42200).
3. *Place* the **phx42** in Sleep Mode.
4. *Remove* the **phx42 lid**.
5. *Power down* the **phx42**.
6. *Identify* the three **battery connectors**.
7. *Hold* the **connectors**, and then carefully disconnect each one from the battery.
8. If tabs are present, *use* them to lift the **battery** out of the **enclosure**.
9. *Return* the **battery** to LDARtools.
10. *Reverse* steps to install new **battery**.
11. *Close* Reported Issue by entering new battery serial number in customer portal.

REMINDER: Do not use any **battery** other than the one sold by LDARtools. The **battery** is made and certified for the **phx42**.

Replacing the Pumps

As with any other repair on a **phx42**, you must first Report an Issue. Failure to do this will void the warranty, if any. When you are instructed by the Tech Support staff to replace the **pump**, follow this procedure:

REMINDER: Before you replace a **pump**, *confirm* that there is no contamination in the probe / sample delivery system. The contamination that ruined the last **pump**, could ruin the new **pump** if not removed. Contamination will always require an RMA.

1. *Remove* the **phx42 enclosure lid**.
2. *Put* the **phx42** into "Sleep Mode".
3. *Cut* the center of the Teflon tubing to *remove* the **pump** (2 on the **Sample Pump**, 1 on the **Combustion Pump**).
4. *Remove* the **pump** from the mounting clip.
5. *Gently* follow the wire to the connector.
6. *Unplug* the connector, pulling from both sides of the connector (not the wire).
7. *Remove* the remaining Teflon tubing from the push-to-connect fitting.
8. *Insert* the new pump into the push-to-connect fitting.
9. *Plug* in the electrical connection.

10. *Replace* the lid.

Close the Reported Issue by entering new pump serial number in the LDAR Support Portal. This will activate the warranty on the *pump*. **Failure to do this will void the warranty**.

FAQ	**Are the sample and combustion pumps interchangeable?** *They are not, as they have different tubing. Attempting to remove and exchange tubing will damage the pump.* *To tell them apart, remember that the sample pump has two pieces of Teflon tubing attached whereas the combustion only has one piece of Teflon tubing attached.*
	What is the warranty on the pump and battery? *Please check the warranty document that you can download at http://www.ldartools.com/#support in the Resources section.*
	Will we have to service the diaphragms on the pumps? *No. The pumps are designed to be plug and play. You cannot service the diaphragms.*

Section 4

LDARtools Technical Support

At LDARtools, we want to ensure that you get the maximum performance from all of the software and equipment that we offer. We have made every effort to provide you with a comprehensive manual to assist you with using our products. If you are having issues with any of our products, please contact us for assistance right away.

For general questions, you can consult a member of LDARtools Technical Support Team by emailing support@ldartools.com.

For equipment issues and before beginning any repair contact LDARtools Technical Support Team by following these directions:

4. *Do* either:
    a. *Self-Check* and *Submit* using the phx42 app.
    b. *Report an issue* at LDARtools.com. Click **Support**, login, then Report Hardware Issue.
    Only use this method if the Self-Check option is not possible and will likely result in an immediate RMA with no on-site troubleshooting possible.
5. If a confirmation email is not received within 30 minutes, please *email* support (support@ldartools.com).
6. *Stand by* for instructions from the LDARtools Technical Support Team.

REMINDER: Equipment being shipped to LDARtools for repair must have a Return Merchandise Authorization (RMA) printed and in the box. Failure to do so will result in extra processing and diagnostic expense and time. The only exception would be written instructions from LDARtools Technical Support Team.

User Login Information

Customer Support
The Customer Support portal allows you to:

- Create Support tickets
- List/Export assets purchased from LDARtools
- Track Assets
- Check Activated Warranties
- Check outstanding Orders that need action
- See what Cores are due
- View Support Case Status (Login, then go to **Hardware Issues > Status**)
- Track phx42 repairs
- Edit User information

URL: http://www.ldartools.com/#support or login through phx42 App

Username*	
Email	
Password	

Training – Litmos
Online training, certifications, and refreshers.
URL: https://ldartools.litmos.com/account/Login

REMINDER: The username on your Customer Support and Litmos accounts must match so that your certification records can sync between the two systems.

Username*	
Email	
Password	

StoreLDAR
Login to the store to track your order history and expedite the checkout process.
URL: http://www.ldartools.com/#webstore

Username	
Email	
Password	

Add to Firewall Whitelist

The following sites must be whitelisted by your site IT Department for effective on-site troubleshooting and support.

- ldartools.litmos.com
- storeldar.com
- ldartools.agiloft.com
- ldartools.com
- time.windows.com
- time.nist.gov
- http://cal.ldartools.com

Section 5

Technical Specifications

What You Get:

- phx42
- Standard Probe
- Shipping Pelican Case

What You Need:

- Hydrogen (H2) Fill Adapter
- External Handheld
- Backpack (**NOTE**: While the selection of the backpack is up to the end user the phx42 must not share a pocket with any other items or tools.)
- Training and Installation – We require all new customers purchase training/install. The phx42 has the best technology and we want to make sure you know how to make it work for you.
- 12v 1 Amp nominal Class II Power Supply with applicable connector fitting.

What You Might Want:

- Software
- Spare Parts Kit – The kit includes all parts you might need for minor on-site repairs.
- Extended Warranty

Warranty and Replacement Parts:

- Repairs are only to be made by LDARtools Certified Personnel. Repair by noncertified personnel will invalidate the warranty and require factory recertification.
- All replacement parts must be obtained from LDARtools. Use of parts from unauthorized vendors will invalidate the product warranty and may impair the intrinsic safety of the device.

Cleaning and Equipment Maintenance:

- The phx42 may be cleaned using a damp rag in a non-hazardous location.
- If the phx42 experiences a defect or malfunction resulting from misuse, or accident including internal contamination it must be returned to LDARtools for factory recertification.

phx42 Operating Parameters

Warm-up Time (M21/LDAR mode)	15 Minutes	
Recommended Sample Flow Rate	.2 - .3 Liters/minute	
Accuracy and Linear Range	M21/LDAR mode	High Sensitivity (currently in Beta. Contact Support for more info)
	The greater of 10% of Reading or +/- 1.0 PPM 0 to 100,000 PPM	+/- .5 PPM 0 to 100 PPM

Certifications and Markings

Method21 Compliant Analyzer

The following is marked directly on the product:

LDARtools, Inc.
1102 Dickinson Ave. Dickinson, TX 77539 USA
Model # 4200
Serial # phx42-xxxx
MM/YYYY
Control Drawing Reference number: D-phx42-DSD
Use only IS Battery Pack: LDAR#42200
Class I, Division 1, Groups A, B, C, D, T3 (Per UL and CSA deviations)
Class I, Zone 1 AEx db ia IIC T3 Gb
CE 0359  II 2G
Ex db ib IIC T3 Gb
AEx db ib IIC T3 Gb
-20°C ≤ Tamb ≤+40°C

The following additional ratings and warnings exist:

- WARNING: To prevent ignition of a hazardous atmosphere, batteries must only be charged in an area known to be nonhazardous.
- AVERTISSEMENT: Pour empêcher l'allumage d'une atmosphère dangereuse, des batteries dovient seulement être chargées dans un secteur connu pour être nonhazardous.
- WARNING: Do not open enclosure in hazardous locations.
- AVERTISSEMENT: n'ouvrez pas l'enceinte dans des endroits dangereux.

Certificates:

ITS17ATEX202629X
IECEx ETL 17.0055X

General Specifications

- Weight: 8 lbs. [3.6 kg]
- Size: 10” x 2.16” x 7.5” = 162 inch^3 [411.48 cm^3]
- Battery life: 10+ hours
- Hydrogen life: 10+ hours

Electrical Parameters

- See D-phx42-DSD for equipment electrical parameters.

Battery and Charging

- Use only IS Battery Pack: LDAR#42200
- See Battery Spec Sheet for pack details.
- Charge with 12v nominal Class II Power Supply with applicable connector fitting.
- Allow 10 hours or overnight to fully charge.

Design Characteristics

- External PDA Control
- Integrated Bluetooth
- FID Only
- Durable Flame Arrestor Housing
- Replaceable Battery
- Connection points all on one side

Ease of Use and Safety Features

- H_2 Fill System: Less risk during filling H_2 bottle
- Flame-out Response: Automatic re-ignition

Electrostatic Requirements

The phx42™ analyzer must be carried within a backpack in normal use. It shall be ensured that this backpack complies with the electrostatic requirements of IEC 60079-0 to prevent electrostatic charging of the equipment contained.

Static electricity occurs commonly in industry and daily life. Many of the effects are harmless and either pass completely unnoticed or are simply a nuisance, but static electricity can also give rise to a hazardous situation. In such situations, the hazard can generally be reduced by charge relaxation. Hazards caused by electrostatic charge include ignition and / or explosion of flammable atmospheres, see IEC 60079-0 and EN 13463-1.

In addition, static electricity can introduce operational problems during manufacturing and handling processes, e.g. by causing articles to adhere to each other, or by attracting dust. Static electricity is generated by:

a) the contact and separation of solids e.g. the movement of conveyor belts, plastics film, etc. over rollers, the movement of a person;
b) the flow of liquids or powders, and the production of sprays;
c) induction phenomena, i.e. objects reach high potential or become charged due
d) to being in an electric field.

The accumulation of electrostatic charge can give rise to hazards and problems in a wide range of industries and working environments, and to ignition and explosion hazards particularly in chemicals, pharmaceuticals, petroleum and food processing industries. Because of the large number of industrial processes that could be involved it is not possible to give detailed information relevant to all of them. Instead, please refer to IEC/TS 60079-32-1-2013 document which describes the problems associated with each process and provides guidance on how to avoid them. This information should enable the plant operator to take whatever precautions could be necessary to avoid ignitions of potentially flammable atmospheres and electrostatic shocks (i.e. conductive floors, dissipative footwear, protective clothing and gloves)."

Special Conditions of Use

- Equipment has the facilities to connect a charger in the non-hazardous area which has been assessed for a maximum Um of 12V. This Um voltage is required to be maintained in accordance with Clause 16.2 of IEC 60079-14.
- Equipment is intended to be carried within a backpack in normal use. It shall be ensured that this backpack complies with the electrostatic requirements of IEC 60079-0 to prevent electrostatic charging of the equipment contained.
- The following metal parts have been considered isolated metal parts and have the potential to hold charge.

  Main Enclosure: 1.78nF
  Probe head: 18.54pF

  Refer to the "Electrostatic Requirements" section of the instruction manual for details on the mitigation of electrical discharge.
- The analyzer must be carried within a backpack which suitably protects the product from unwanted metal to metal impact and thus prevents possibility for dangerous sparking in explosive atmospheres.
- Equipment contains an FID housing certified to protection concept Ex db. Per the requirements of this standard no modification or repair is permitted to be made to the equipment flamepaths.

Applicable Standards and Directives

Ordinary Locations Safety Standards	
IEC 61010-1: 2010 +C1: 2011 +C2:2013	Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements *Note: For CB Scheme
EN 61010-1: 2010	Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements *Note: For European differences of CB Scheme
UL 913: Ed 8: 2013 and	Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations
CAN/CSA-C22.2 NO. 157-92 (R2016)	Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations
UL 61010-1-2012 and CSA C22.2 No. 61010-1-12	Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements *Note: For USA and Canada national differences of CB Scheme
Hazardous Locations Safety Standards	
IEC 60079-0: 2011 +C1: 2012 +C2:2013	Explosive atmospheres - Part 0: Equipment - General requirements *Note: For IECEx Certification
IEC 60079-1: 2014	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d" *Note: For IECEx Certification
IEC 60079-11: 2011 +C1: 2012	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i" *Note: For IECEx Certification
EN 60079-0: 2012 / A11:2013	Explosive atmospheres - Part 0: Equipment - General requirements *Note: For ATEX Certification
EN 60079-1:2007	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d" *Note: For ATEX Certification
EN 60079-11:2012	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i" *Note: For ATEX Certification
UL 1203, 5th Ed., Revised: 04/24/2015	Explosion-proof and Dust-ignition-proof Electrical Equipment for use in Hazardous (Classified) Locations *Note: For USA listing certification (Division scheme)
UL 60079-0, 6th Ed., Revised: 07/26/2013	Explosive atmospheres - Part 0: Equipment - General requirements *Note: For USA listing certification (Zone scheme)
UL 60079-1, 6th Ed., Revised: 08/09/2013	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d" *Note: For USA listing certification (Zone scheme)

UL 60079-11, 6th Ed. Revised: 03/28/2014	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i" *Note: For USA listing certification (Zone scheme)
CSA C22.2 No. 30 – 1986, R2012	Explosion-proof Enclosures for use in Class I Hazardous Locations *Note: For Canada listing certification (Class I, Division 1)
CSA C22.2 No. 25 – 1966, R2014	Enclosures for Use in Class II, Groups E, F, and G Hazardous Locations *Note: For Canada listing certification (Class I, Division 1)
CSA C22.2 No. 60079-0: 2011	Explosive atmospheres - Part 0: Equipment - General requirements *Note: For Canada listing certification (Zone scheme)
CSA C22.2 No. 60079-1: 2011	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d" *Note: For Canada listing certification (Zone scheme)
CSA C22.2 No. 60079-11: 2014	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i" *Note: For Canada listing certification (Zone scheme)

EU Directives	
PED 2014/68/EU	The pxh42 Gas Analyzer does not fall into a PED category but must be designed in accordance with Article 4.3, commonly referred to as Sound Engineering Practice.
EN 1127-1:2011	See Technical File Lodging.

Environmental Conditions Affecting Use

The following table describes the conditions where using the device and sample stream monitoring is recommended:

External Influence	Reference Operating Conditions	Normal Operating Conditions	Operative Limits	Transportation and Storage Limits
Ambient Temperature	23±2 °C 73±2 °F	-20 to +40 °C -4 to 122 °F	-20 and +40 °C -4 and 122 °F	-20 to +40 °C -4 and 122 °F
Ambient Pressure	860 to 1060 mbar	70 to 108 kPa		20 to 108 kPa
Relative Humidity	50%±10%	FID: 20 to 95% noncondensing	15 and 95% noncondensing	0 to 100%
Conducted Susceptibility		N/A (The phx42 is battery-operated)		
Conducted Emission		N/A (The phx42 is battery-operated)		
ESD Sensitivity			>6000 Volts	
Battery Charging Voltage	12V DC	12V DC		N/A
Elevation for Use	Sea Level	Max 2000M	Max 2000M	

Chemical Exposure

The phx42 Gas Analyzer uses a flame ionization detector to analyze atmospheric samples containing hydrocarbons. Sample gas is collected and passed through a hydrogen flame and ions from combustion of the sample are measured, recorded, and reported. Primary gas used for equipment calibration is Methane in Air (various concentrations).

phx42 Manual Changelog		
Rev1	3/8/2018	Added to Technical Specifications section
Rev1.2	4/9/2018	Added Uncontrolled If Printed watermark and pump repair procedures
Rev1.3	5/7/2018	Added Flame Arrestor warning
Rev1.4	5/15/2018	Added Changelog, revised power button indicator table and title page
Rev1.5	5/22/2018	Moved changelog, edited pulse pattern, added references to phx42 report feature, and other miscellaneous changes.
Rev1.6	6/19/2018	Added “the Big Picture”, List of “phx42 skills”, updated power button table, added “Sleep Mode” and “Power Down” Definition, added “Rapid Blink” definition to “Power Button Indicators” table, added “Tech Tip” to Hydrogen Fill section. Expanded the Charging procedure. Added Terms, Source and Explanations to 42App section.
Rev1.7	6/22/2018	Added Scrubber medium replacement procedure, added receiving from shipping procedure, removed duplicate backpack details, moved probe inspection to the beginning of the level 1 section. Added Tech Tips to the charging and pump replacement procedure.
Rev1.8	8/01/2018	Added Best Practice to H2 fill section. Added Best Practice, Note, Important, Tech Tip icons. Revised spare parts kit to include spare part numbers per phx42, increase quantity of sample pumps to 2, and added h2 fill cover to list. Added FAQ questions on extension probe and sample pumps. Added 42App error code table. Added Glow disk Repair Procedures. Changed “glow-disk” to “glow disk.” Added tubing description to weekly probe integrity check. Added phx42 operating parameters. Grammar and punctuation changes. Added quick disconnect image. Changed column order for "Power Button" section. Added missing sections to ToC.
Rev1.9	10/01/2018	Added reference to Docs section of Support Portal. Formatting changes. Added orientation references to the external parts section. Changed Tech tip/Note/Important to Tech tip/Reminders. Added FAQs. Revised Receiving After Shipping. Added instructions on how to take level one test. Revised the toolkit inventory page. Revised the weekly probe inspection section. Revised the removal and reinstallation of the enclosure lid. Revised the Scrubber media section. Added the glow disk repair section. Added the User login information section.
Rev2.0	01/10/2019	Added Antenna Procedure. Added fill adapter and O-ring maintenance note. Changed power connection to electrical connection. Added plastic filter collar procedures. Added note on differences between sample and combustion pumps. Edited calibration section to include recalibration to zero note. Added note on Support Portal and Customer login page. Added Firewall whitelist. Added Probe construction and probe repair sections.
Rev2.01	1/18/2019	Updated Filter Detection Section, clarified reignition attempt criteria. Updated flow rate to .2 - .3 in Technical section. Edited Manual Calibration procedure. Added FAQ to Pump section.
Rev 2.02	10/15/2019	Corrected formatting. Added Technical Support section.