



# LDCRYO

## USER'S MANUAL

CARRIER GAS PURIFICATION SYSTEM



***LDCRYO***

**Carrier gas purification system**

**USER'S MANUAL**  
V1.0

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## 1. Forewarning

This manual is required to be read by any user that wants to use the LDCRYO Carrier gas purification system. It contains important information to successfully operate this instrument. LDeTek assumes that all operators have taken the time to read this information prior to installation, operating and troubleshooting this system.

If any error is suspected by the reader, please contact LDeTek. LDeTek reserves the right to make any changes to subsequent editions of this document without prior notice to holders of this edition.

We want to thank you for choosing LDeTek as your gas equipment supplier.

## 2. Warranty, maintenance and service policies

Goods and part(s) (excluding consumable) manufactured by the seller are warranted to be free from defects in workmanship and material under normal use and service for a period of **twelve (12)** months after installation and start-up and not exceeding **18 months** from shipment date. Consumable, chemical trap, O-rings, etc., are warranted to be free from defects in workmanship and material under normal use and service for a period of ninety (90) days from the date of shipment by the seller. Goods, part(s) proven by the seller to be defective in workmanship and/or material shall be replaced or repaired, free of charge, F.O.B. Seller's factory provided that the goods, part(s) are returned to Seller's designated factory, transportation charges prepaid, within the twelve (12) months after installation and start-up and not exceeding 18 months from shipment date. In the case of consumable, within the ninety (90) days period of warranty, a defect in goods, part(s) and consumable of the commercial unit shall not operate to condemn such commercial unit when such goods, part(s) and consumable are capable of being renewed, repaired or replaced.

The Seller shall not be liable to the Buyer, or to any other person, for the loss or damage directly or indirectly, arising from the use of the equipment of goods, from breach of any warranty, or from any other cause.

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**Major force.** The seller is not liable for failure to perform due to labour strikes or acts beyond the seller's direct control.

#### SERVICE POLICY

1. If a product should fail during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labour and materials rates.
2. Customers who return products for repairs, within the warranty period, and the product is found to be free of defect, may be liable for the minimum current repair charge.
3. For parts replacement, the original part must be returned with serial and model numbers of the analyzer. **NO PART WILL BE SHIPPED IF THE ORIGINAL IS NOT SENT BACK TO LDETEK INC.**

## RETURNING A PRODUCT FOR REPAIR

Upon determining that repair services are required, the customer must:

- ❖ Obtain an RMA (Return Material Authorization) number;
- ❖ Supply a purchase order number or other acceptable information;
- ❖ Include a list of problems encountered along with name, address telephone, and RMA number;
- ❖ Ship the device in its original crating or equivalent. Failure to properly package the analyzer will automatically void the warranty;
- ❖ Every gas connection must be capped with appropriate metal caps. Failure to do so, it will automatically void the warranty;
- ❖ Write RMA number on the outside of the box;
- ❖ Use an LDetek approved carrier. Also, the delivery must be sent to LDetek facilities. LDetek will not accept airport to airport delivery;
- ❖ LDetek will not cover the transportation fees.

Other conditions and limitations may apply to international shipments.

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Buyer agrees that any LDetek's software, firmware and hardware products ordered or included in the goods ordered are proprietary of LDetek. No change, modification, defacement, alteration, reverse engineering, neither software de-compilations nor reproduction of such software or hardware products, or disclosures of programming content to other parties is authorized without the express written consent of LDetek.

To maintain LDetek's trade secret and other proprietary protection of such software and firmware, such items are not sold hereunder but are licensed to the buyer.

LDetek Inc. reserves the right to interrupt all business relationship and warranty or service if there is any tentative from any customers to reverse engineering any of LDetek products or to tamper with any sealed module.

Trademarks and product identification as LDCRYO are the property of LDetek Inc. and shall be used only in connection with LDetek's products. No third party could remove or deface any model number or marks.

## 3.Specifications

The LDCRYO is a stand-alone cryogenic trap system design to purify the carrier gas used for GCs. More specifically the carrier gas used for ppt/ppb analysis. In combination with the LDP1000/LDP2000 heated gas purifier series, adding the LDCRYO will increase the carrier gas purity and also removed the Argon impurity from the Helium carrier gas source. The system can monitor the trap inlet and the outlet pressures and generate an independent low-pressure alarm when the pressure level is below the normal operating pressure range. If the pressure level for both sides in/out is below the setpoint, a second alarm is generated, and a local buzzer is activated. The pressure sensors use are heavy duty series operating in the range of 0-200psig(0-14bar)

The LDCRYO comes with a 50 liters Dewar and a stainless-steel wall mount plate with VCR valves assembly. The gas connections between the valves assembly and the traps are completed with flexible braided stainless-steel hoses. The traps, made of stainless-steel with VCR ends are plunged in liquid nitrogen. When a trap must be replaced, due to an alarm indication, it is easy to isolate the trap with the valve network and use the backup trap without carrier gas interruption to the GC system. A blank cap is included to secure the cover of the Dewar, the time the trap is in regeneration.

### 3.1 Power Input (LDPMS)

AC Voltage	85 ~ 264VAC
Frequency Range	50 ~ 60Hz
AC Current (Typ.)	< 0.1A
Intern Fuses	1A (model 9611000440 of Littelfuse Inc. or compatible)
Connector Style	IEC 320-C14

### 3.2 Sensor Input

Full scale	0.5V to 4.5V (0 to 3000psi)
Sensor voltage supply	5V
Sensor current max.	0.8A for all sensors



### **3.3 Relay Output**

Dry contact	N.O and N.C.
Rated load (resistive load)	0.4A at 120VAC 2A at 30VDC
Rated load (inductive load)	0.2A at 120VAC 1A at 30VDC
Max switching voltage	250VAC, 220VDC

### **3.4 Serial Port**

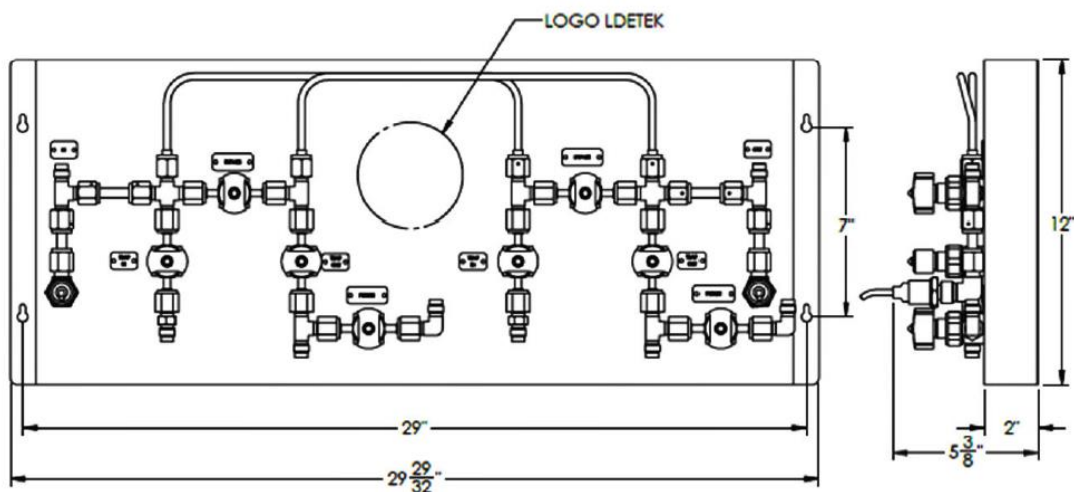
Type	RS-232
Connector	Male DE-9 (DB-9)
Protocol supported	Modbus RTU
Baud rate supported	9600, 19200, 38400, 57600
Parity	None
Data bits	8
Stop bits	1

### **3.5 Environment**

Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C
Operating Relative Humidity	Maximum 90% non-condensing
Thermal Shock	Maximum 10°C /min

### 3.6 Dimensions

Valve assembly wall mount plate



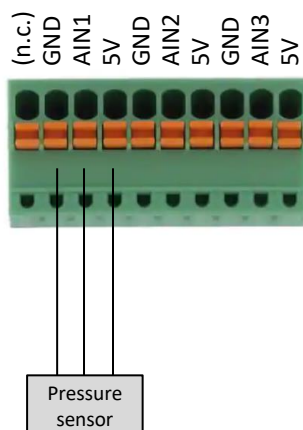
Height: 12'' (305mm)  
 Thick: 2'' (50mm)  
 Wide: 30'' (762mm)

Dewar height: 29.65'' (753mm)  
 Dewar diameter: 18.15'' (461mm)

## 4. Wiring and installation information

### 4.1 Pressure sensors

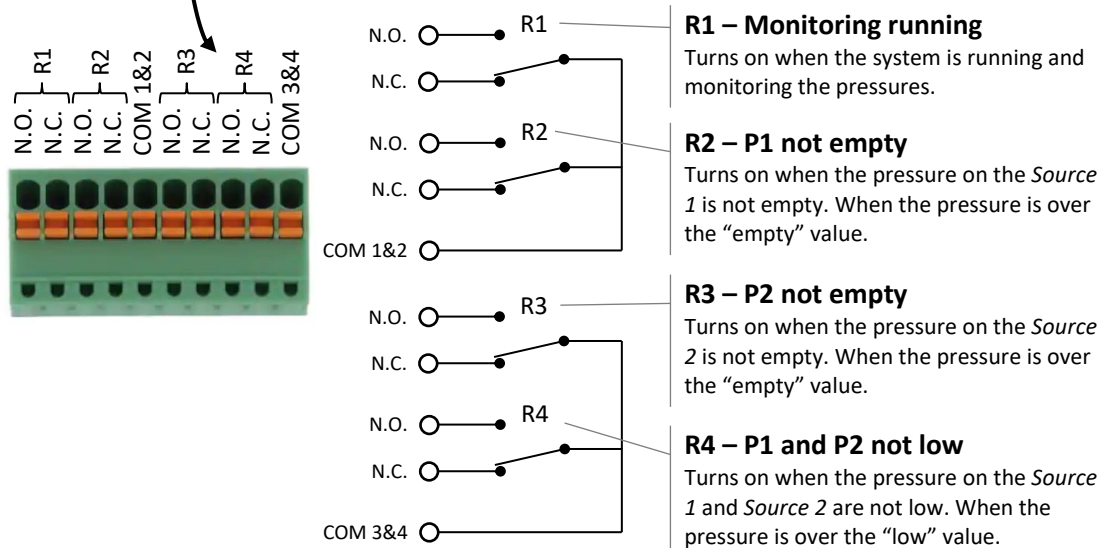
The LDCRYO is designed to work with the family of Honeywell heavy duty pressure sensor series MLH . The sensor is supply with the 5VDC and the sensor output must go from 0.5V to 4.5V for its range of 0 to 200 psig.



(n.c.)	(Not connected)
<b>GND</b>	Return for the 5VDC supply
<b>5V</b>	5VDC supply (0.8A for all 5V pin)
<b>AIN1</b>	Analog Input #1 for the sensor #1 output 0.5V to 4.5V
<b>AIN2</b>	Analog Input #2 for the sensor #2 output 0.5V to 4.5V
<b>AIN3</b>	(For future usage)

## 4.2 Relays

The status of the LDCRYO can be obtain from the 4 relays on the device. You can connect any voltage from 250VAC or 220VDC or below. You can use the normally close or normally open contact from any relay.

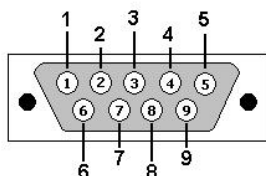


Note:

- If everything is fine, all relays are turned ON.
- If anything goes bad, a relay will turn OFF.
- It is designed to be “fail-safe”, if the power is down or wire broken, you have more chance to detect it as a bad condition.

## 4.3 Modbus RTU

All the information contains in the LDCRYO can be read by Modbus RTU using the RS-232 port. See the section about the Modbus mapping for more details about this information. To connect a computer and a LDCRYO together use a DB-9 null-modem cable.



DB-9M pinout	Signal
1, 4, 6, 7, 8, 9	(Not connected)
2	RX
3	TX
5	GND
Case	(Not connected)

## 4.4 Main power

!!! WARNING !!!

Connect the AC main supply only when everything is correctly wired. Any bad wiring can damage this device, or any device connected to it.

Connect the power cord supply with the device into any AC outlet from 100VAC to 240VAC 50Hz-60Hz. You can use any power cord with an IEC 320-C14 end that fit your need.



Main Power  
connector

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## 5. Settings

### 5.1 Alarms

<b>Inlet Nominal Pressure</b>	
<u>On the display</u> 1.1 P1 PRESSURE	<u>Description</u> The nominal pressure on the Inlet. In other words, the pressure you are expecting at the inlet.
<b>Outlet Nominal Pressure</b>	
<u>On the display</u> 1.2 P2 PRESSURE	<u>Description</u> The nominal pressure on the Outlet. In other words, the pressure you are expecting at the outlet.
<b>Inlet Pressure deviation tolerance</b>	
<u>On the display</u> 1.3 P1 DEVIATION	<u>Description</u> The deviation tolerance you can accept from the nominal pressure on the inlet.
<b>Outlet Pressure deviation tolerance</b>	
<u>On the display</u> 1.4 P2 DEVIATION	<u>Description</u> The deviation tolerance you can accept from the nominal pressure on the outlet.

---

## 5.2 Device

<b>Displayed unit</b>	
<u>On the display</u> 2.1 UNIT	<u>Description</u> Select among all units available the unit you want to use on the display (does not affect Modbus register). Currently you can choose between psi, kPa and bar.
<b>Inactivity delay</b>	
<u>On the display</u> 2.2 INACTIVITY	<u>Description</u> This is the delay before the display goes in sleep mode. In sleep mode: <ul style="list-style-type: none"><li>• The brightness of the display goes to 50%.</li><li>• The backlighting of the keypad goes off.</li><li>• The display come back to the main menu.</li></ul> You can enter a value between 1 to 120 minutes.
<b>Buzzer</b>	
<u>On the display</u> 2.3 BUZZER	<u>Description</u> When an alarm occurs on the Inlet & Outlet, if this settings is ON, the buzzer will emit sounds.



## 5.3 Modbus

<b>Baud Rate</b>	
<u>On the display</u> 3.1 BAUD RATE	<u>Description</u> You can select the baud rate for the serial port. You can choose between 9600, 19200, 38400 and 57600.
<b>SLAVE ID</b>	
<u>On the display</u> 3.2 SLAVE ID	<u>Description</u> This is the Slave ID of this device. Sometimes it can be called <i>node number</i> , <i>node address</i> ... You can choose a value between 1 and 250.

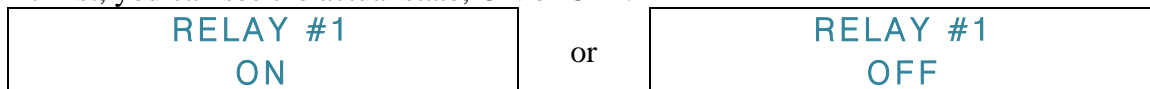
## 6. Diagnostic

With the LDCRYO you have access at some diagnostic tools.

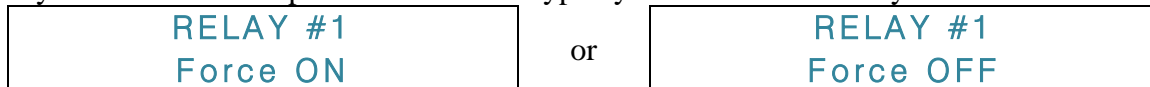
### 6.1 Relays

On the display with the keypad, you can diagnostic the relays.

At first, you can see the actual state, ON or OFF.



If you use the arrow up or down on the keypad you can force the relay at ON or OFF



### 6.2 ADC

On the display with the keypad, you can diagnostic the voltage read on the analog inputs.

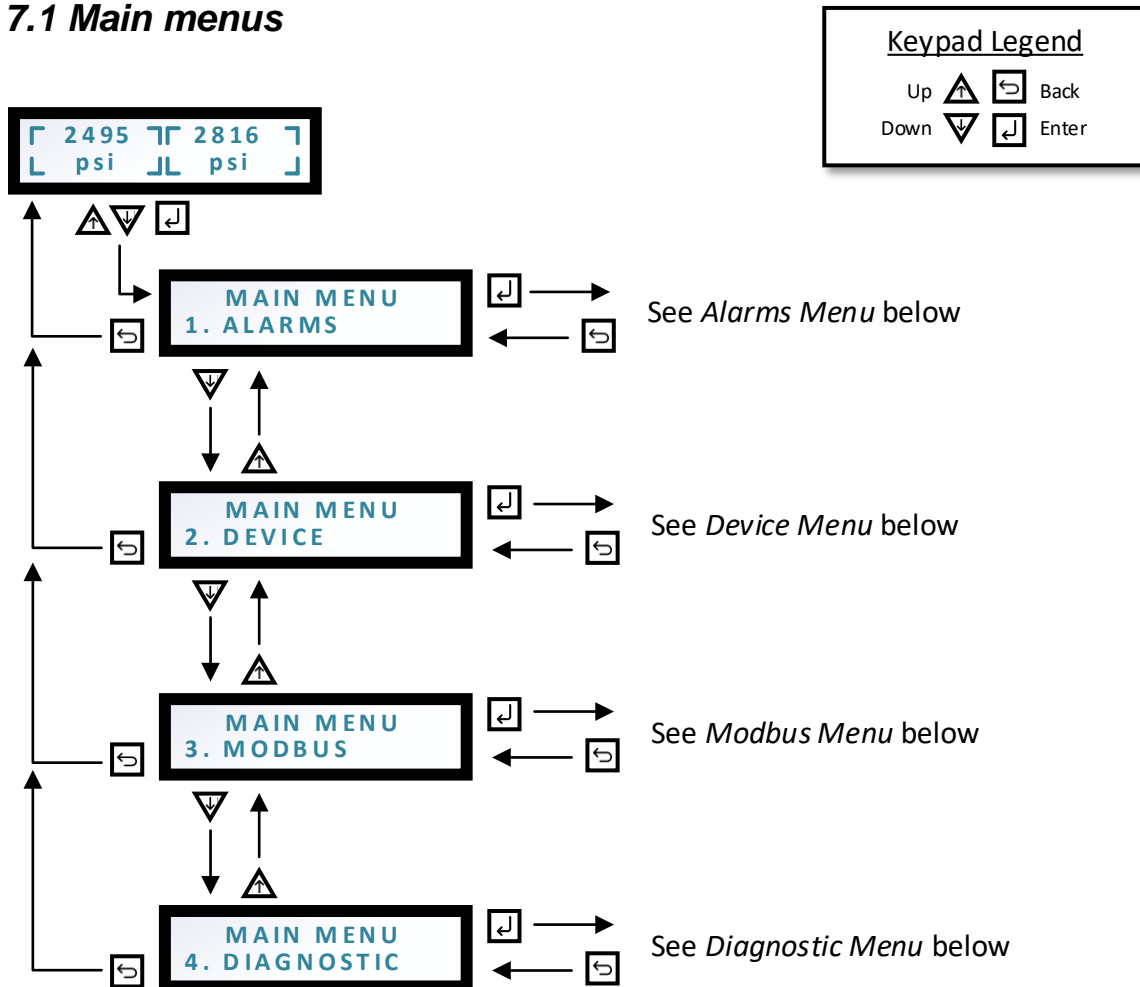
With the example below.



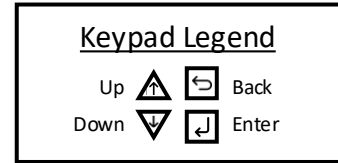
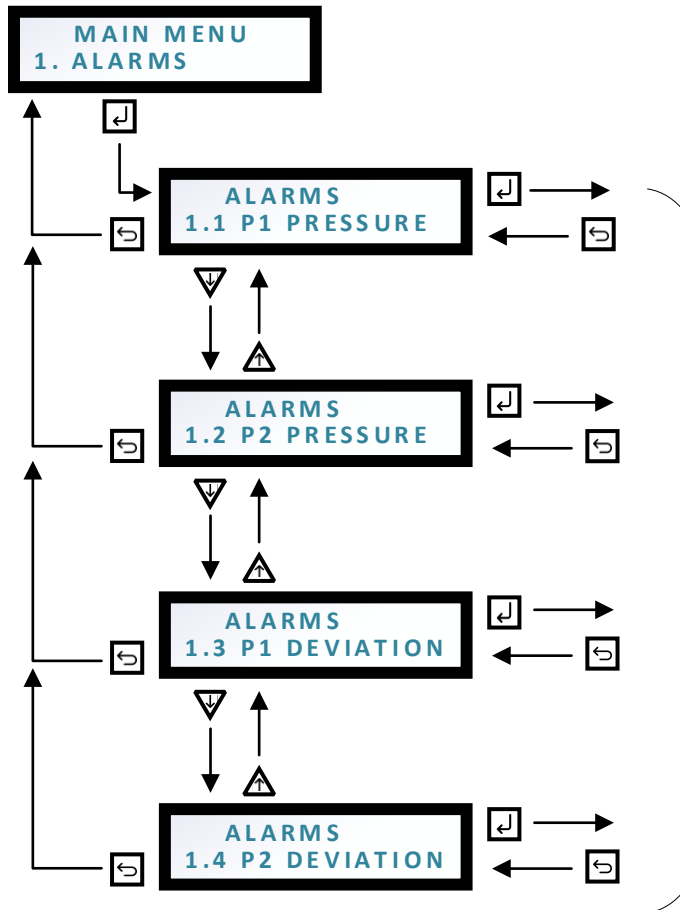
If we put a multimeter between the pin AIN1 and GND we should read a value close to 2430 mV.

## 7. Menu Layout

### 7.1 Main menus



## 7.2 Alarms menus



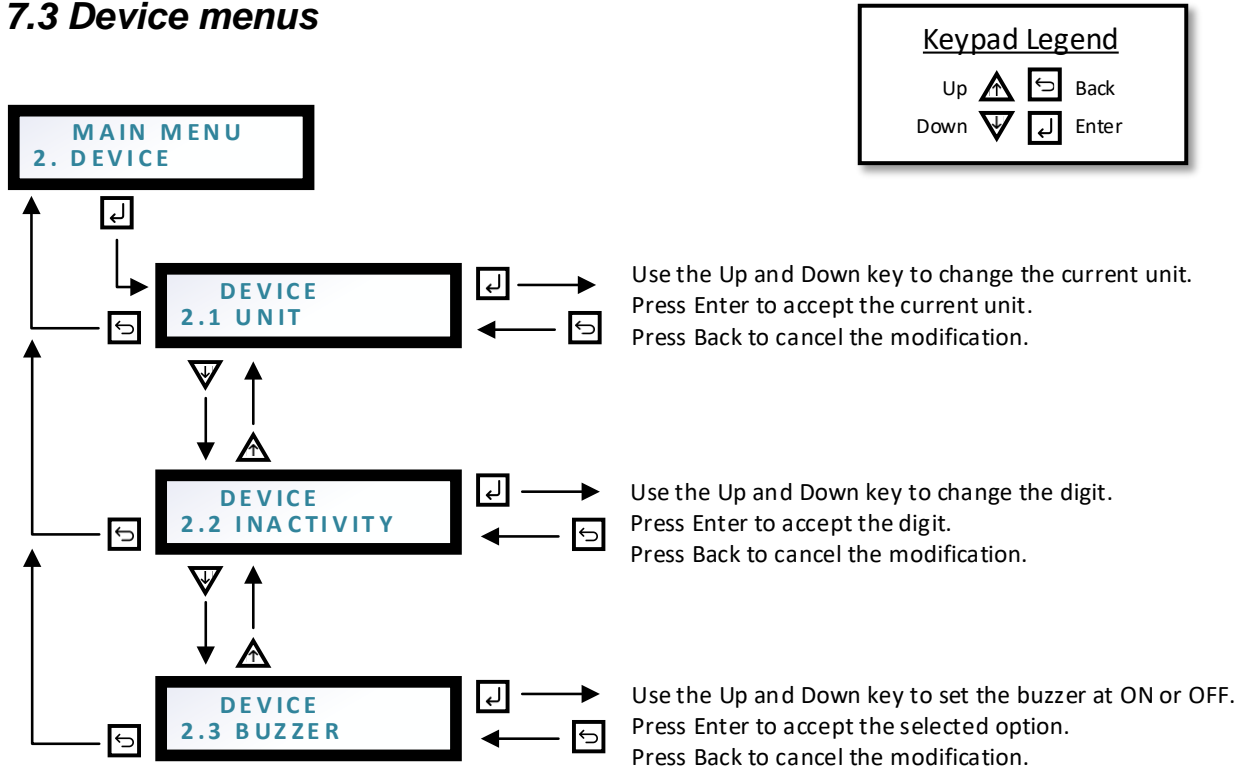
Use the Up and Down key to change each digit from 0 to 9.

Press Enter to accept the current digit and change the next digit.

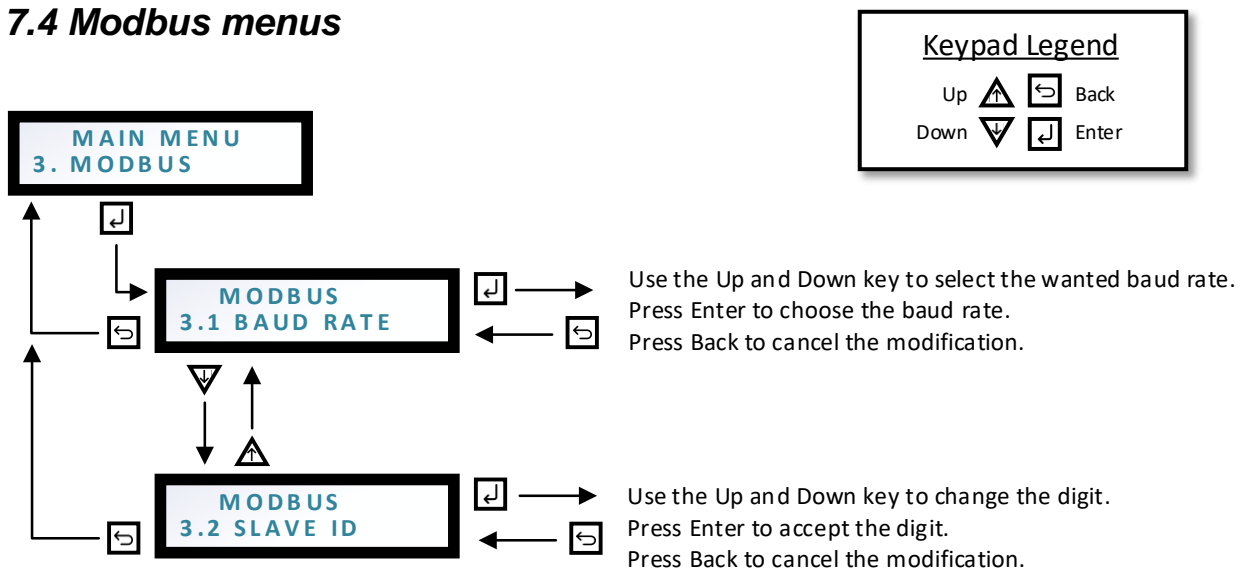
Press Enter at the last digit to save the new value.

Press Back to cancel the modification.

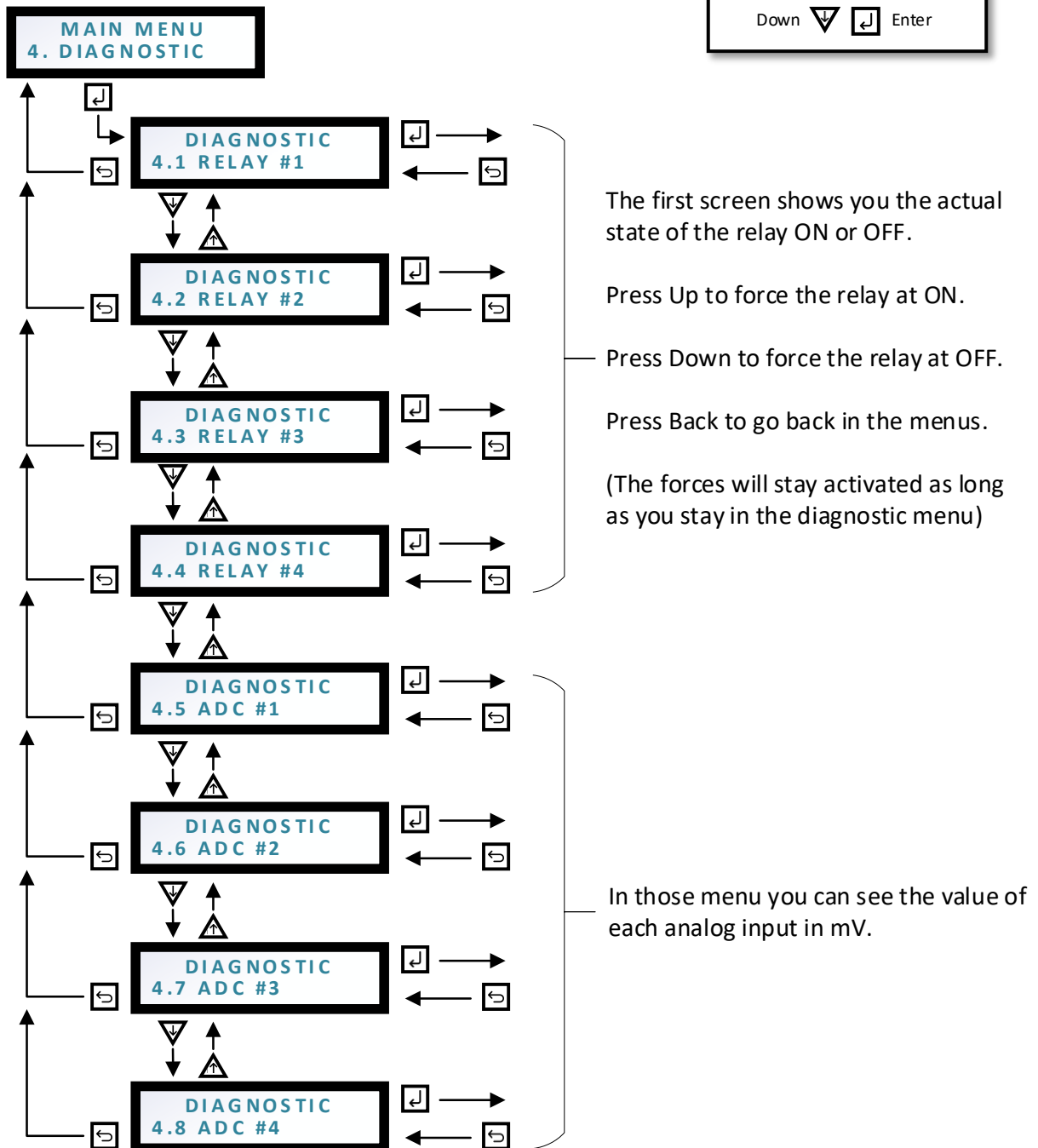
### 7.3 Device menus



### 7.4 Modbus menus



## 7.5 Diagnostic menus



## 8.0 LEDs

The LDCRYO has three LEDs on the front.



Status	Blinking green	Everything is fine.
	Blinking red	The pressure on Source1 or Source2 are out of the operating range
	Blinking faster than 1s	It is because it receives data on the Modbus.
Source 1	Solid green	Pressure is within the operating range for inlet.
	Solid red	Pressure is out of the operating range for inlet
Source 2	Solid green	Pressure is within the operating range for outlet.
	Solid red	Pressure is out of the operating range for outlet

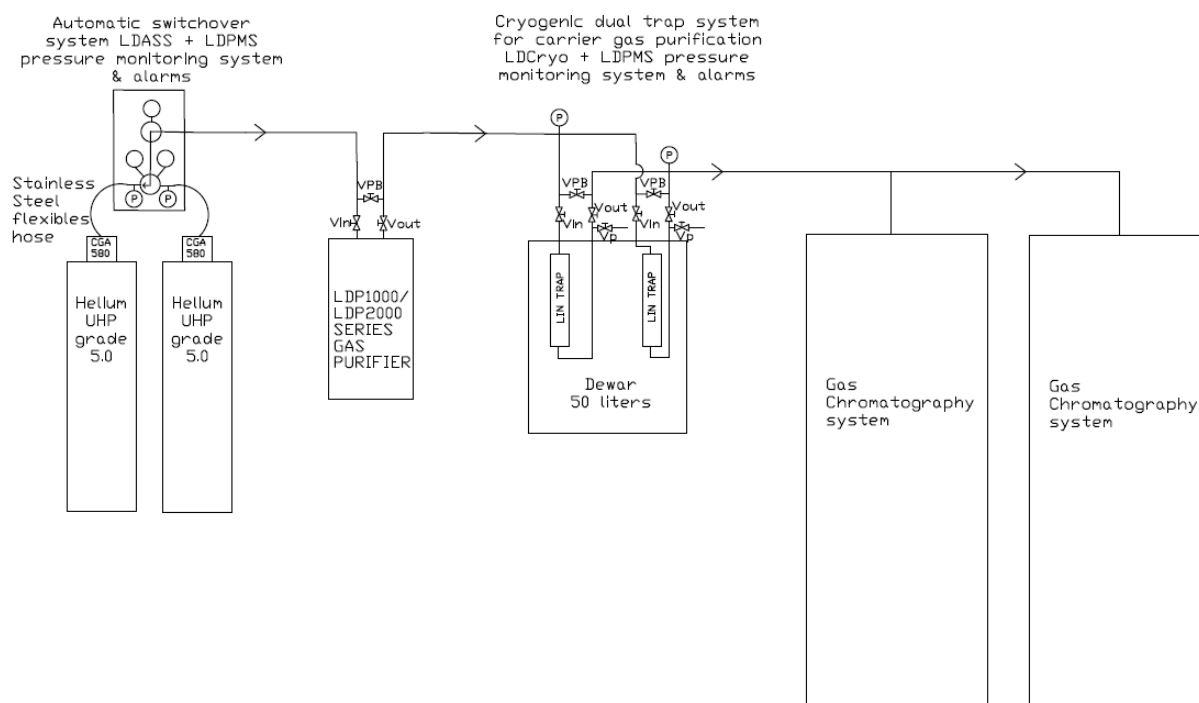
## 9.0 Typical applications & maintenance

### 9.1 Typical gas chromatograph carrier supply installation

Having the right carrier gas supply is critical for any gas chromatograph installation, more particularly for detection of ppt/ppb/ppm. The diagram here will show our LDASS automatic switchover system that interconnect multiple Helium bottles as one carrier source. The system uses our LDPMS pressure monitoring system to advise when a Helium bottle gets low in pressure. Then, the switchover can automatically switch on the backup cylinder. This ensures the system is constantly under Helium source without interruption.

Then, the Helium gas is purified by the first stage of purification with our heated gas purifier series LDP1000 or LDP2000. The getters here are used to remove all impurities at the exception of trace Argon.

The role of the second stage of purification here is with our LDCRYO system that uses liquid nitrogen in a 50 liters Dewar where 2 stainless steel traps packed with Molecular Sieve 13x pellets are plunged in. The Argon and remaining impurities are then freeze letting the Helium out, absolutely impurity free (grade 99.9999999%). The LDCRYO inlet and outlet pressure are monitored here again with our LDPMS pressure monitoring system. When an alarm goes on, the operator must isolate the trap using the valves on the panel and then allow the gas source going through the spare trap already in place in the Dewar. Going this way, no carrier gas supply interruption can happen. The trap in default can be easily removed from the Dewar for re-activation. For re-activation, it is preferred to contact an LDeTek expert to return the trap to factory for regeneration.





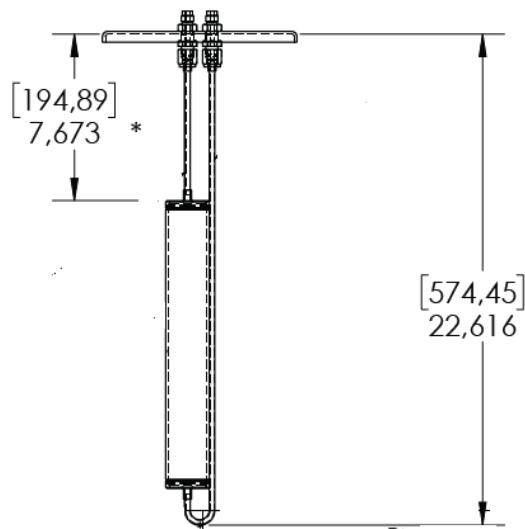
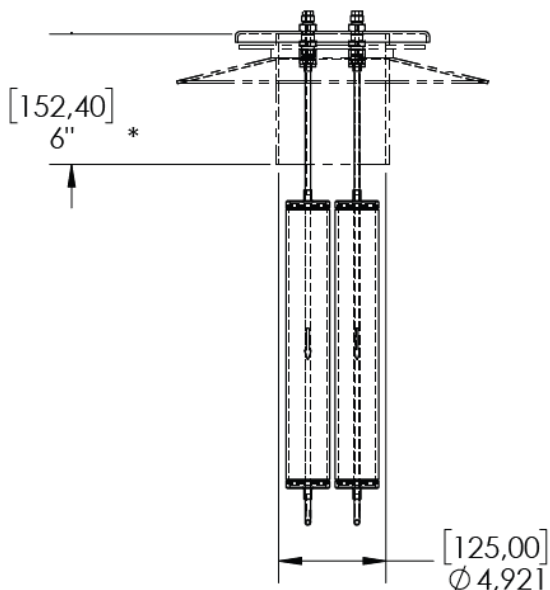
## 9.2 How to replace the trap



The LDCRYO is by default configured with two cold traps. Each trap is individually fixed to the top cover plate with ¼" VCR fittings. When the LDPMS indicates a low pressure alarm on a trap, then the valves on the valve panel must be manually switched to the backup new cold trap. The default cold trap is then isolated from the Helium gas source and can be removed from the Dewar.

1. Unscrew the external flexible hoses by loosening the external VCR fittings.
2. Unlock the cover and remove from the Dewar by pulling out the "half moon" section holding the default cold trap.
3. If you have a spare cold trap, you can install the new trap in place as backup. If not, then install the blank "half moon" top cover that is included to secure the liquid nitrogen in the Dewar.
4. The default cold trap can be shipped back to LDeTek for regeneration/activation once removed.

**NOTE : During the replacement process, it is required to wear proper security equipment to handle Liquid Nitrogen. Proper gloves and glasses/visor to protect from liquid nitrogen.**



## 10.0 Modbus mapping

You can exchange data by Modbus RTU with a LDCRYO.

The only function you need is the function 3, to read multiple holding registers.

If you attempt to send any other functions, they will be ignored, and you will not get a response.

### 10.1 Device Info

The device information section is the place where the device is described.

Register	R/W	Type	Description
41001	R	UINT16	LDetek Identification number, always 31307
41002	R	UINT16	Modbus version, start with 1000 and increment if future version make important change in the mapping.
41003	R	ASCII[16]	Product name
41011	R	ASCII[16]	Model name
41019	R	ASCII[16]	Serial number
41027	R	ASCII[16]	Software version

## 10.2 Device Status

The device status section is the place to get actual information on the device.

Register	R/W	Type	Description
42001	R	UINT16	Status word 1 <ul style="list-style-type: none"><li>• Bit00 : System is monitoring</li><li>• Bit01 : Pressure1 is in range</li><li>• Bit02 : Pressure2 is in range</li></ul>
42002	R	UINT16	Pressure1 in PSI
42003	R	UINT16	Pressure2 in PSI
42004	R	UINT16	Pressure3 in PSI
42005	R	UINT16	Pressure4 in PSI
42006	R	UINT16	Pressure1 nominal range in PSI
42007	R	UINT16	Pressure1 deviation tolerance in %
42008	R	UINT16	Pressure2 nominal range in PSI
42009	R	UINT16	Pressure1 deviation tolerance in %



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Where **innovation** leads to **success**