DOD Technologies

ChemLogic® CL1 & CL2

1 & 2-Point Continuous Gas Detectors

Operating Manual

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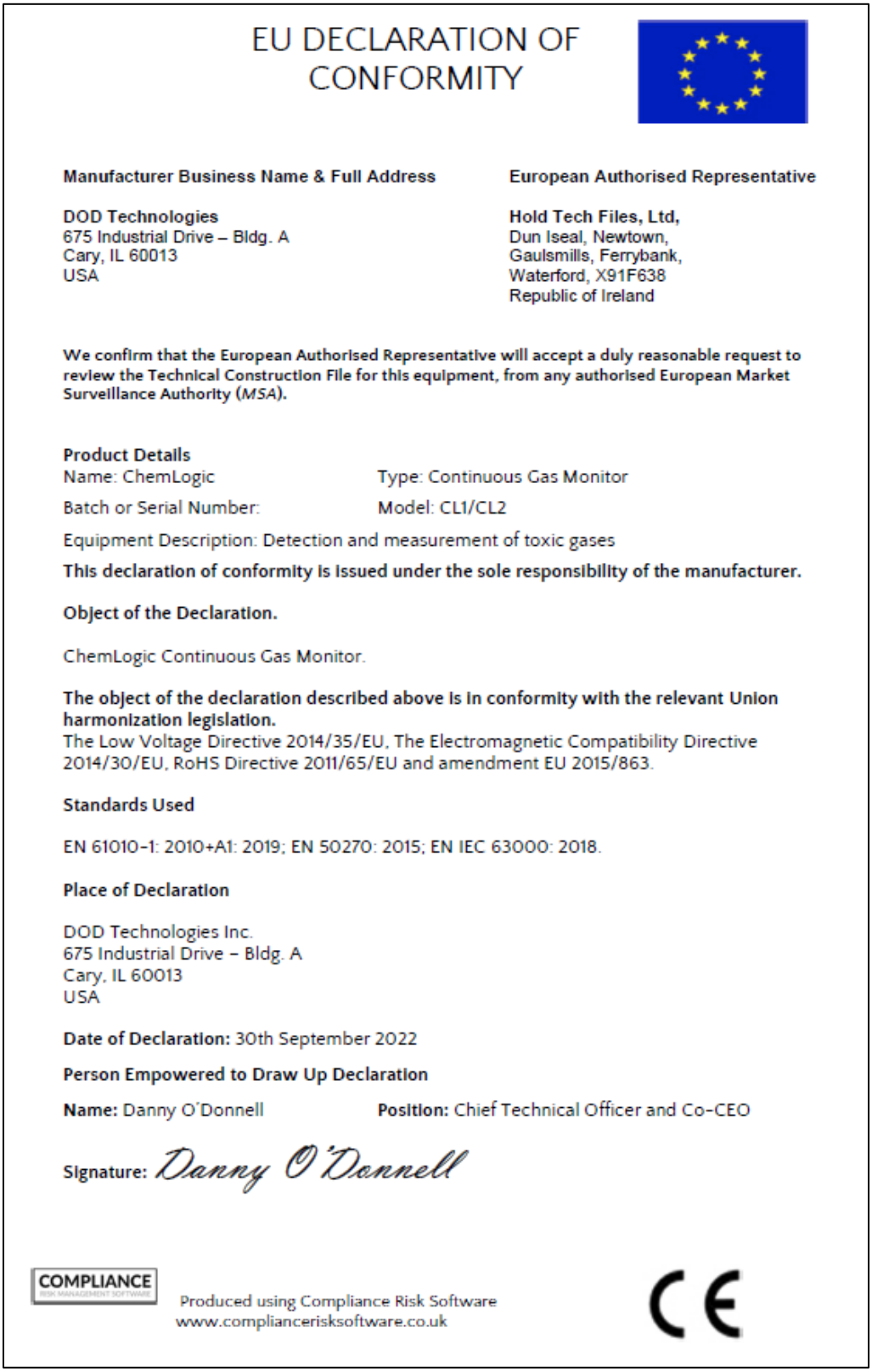

EU DECLARATION OF CONFORMITY

Manufacturer Business Name & Full Address

DOD Technologies
675 Industrial Drive – Bldg. A
Cary, IL 60013
USA

European Authorised Representative

Hold Tech Files, Ltd,
Dun Iseal, Newtown,
Gaulsmills, Ferrybank,
Waterford, X91F638
Republic of Ireland

We confirm that the European Authorised Representative will accept a duly reasonable request to review the Technical Construction File for this equipment, from any authorised European Market Surveillance Authority (*MSA*).

Product Details
Name: ChemLogic Type: Continuous Gas Monitor
Batch or Serial Number: Model: CL1/CL2
Equipment Description: Detection and measurement of toxic gases

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the Declaration.

ChemLogic Continuous Gas Monitor.

The object of the declaration described above is in conformity with the relevant Union harmonization legislation.
The Low Voltage Directive 2014/35/EU, The Electromagnetic Compatibility Directive 2014/30/EU, RoHS Directive 2011/65/EU and amendment EU 2015/863.

Standards Used

EN 61010-1: 2010+A1: 2019; EN 50270: 2015; EN IEC 63000: 2018.

Place of Declaration

DOD Technologies Inc.
675 Industrial Drive – Bldg. A
Cary, IL 60013
USA

Date of Declaration: 30th September 2022

Person Empowered to Draw Up Declaration

Name: Danny O'Donnell **Position:** Chief Technical Officer and Co-CEO

Signature: Danny O'Donnell

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CE

A copy of this document can be obtained by clicking the image above or by visiting the following link:
https://dodtec.com/amfile/file/download/file/113/product/265/

Table of Contents

Chapter 1 – Overview

1.1 Introduction

WARNING:
Operation of the ChemLogic® CL1 (single point) / CL2 (dual point) continuous gas detection system without a manual in the native language of its country of operation is illegal. A translated copy of the manual should be requested immediately from DOD Technologies and before installation of the device. Failure to do so may result in severe injury.

Contact:
Phone: +1 815-788-5200
DODtec.com

ChemLogic CL1/CL2 continuous gas detection systems should be used exclusively for the quick detection of toxic, corrosive, and asphyxiant gases for process measurement and personnel safety purposes. Failure to comply with the intended purpose of the device may result in injury or death.

ChemLogic CL1/CL2, from DOD Technologies, continuously monitors a single or double location (called a point) for toxic and corrosive gas. It responds to gas that exceeds a programmed alarm level by:

- Triggering visual alarms on the display that warn of high or low concentrations
- Triggering relays or activating analog outputs to external devices
- Displaying the gas type and gas concentration
- Recording the alarm information and storing it to removable storage.

The CL1/CL2 triggers relays for two levels of gas concentrations. These programmable limits are factory-set at 1 TLV and 2 TLV for their respective gases.

The point may be up to 150 feet (45 m) from the CL1/CL2 location depending on the type of gas being monitored. This allows operators to monitor the gas concentration in an area removed from the location where gas may be leaking.

The CL1/CL2 provides a fast response to a wide range of gases. It was designed for maximum uptime, so routine maintenance and service can be performed quickly and easily.

The CL1/CL2 uses ChemLogic® Cassettes with colorimetric technology for fast and accurate gas detection.

1.2 Sampling and Monitoring

The system draws sample flow through the inlet on the bottom of the unit and across the ChemLogic® Cassette. The gas is then exhausted through a port on the side of the CL1/CL2.

1.3 Flow Connections

Flow connections consist of “quick-connect” ports on the bottom and side of the CL1/CL2. There is one inlet and one exhaust outlet.

1.4 Electrical Connections

The unit is powered with a standard AC Power plug. A single 14 pin connector on the side of the CL1/CL2 provides all electrical connections for the outputs and remote reset.

NOTE: Maximum Branch-Circuit Rating = 20 Amperes

1.5 Theory of Operation

The sample flow is diverted across the ChemLogic® Cassette. The ChemLogic CL1/CL2 uses an advanced optical detection system to measure the light level reflected from the ChemLogic Cassette. As the target gas is detected, the color of the colorimetric tape within the cassette changes. This color change results in a loss of reflected light which is detected by the CL1/CL2 advanced optics system. The CL1/CL2 will then report an appropriate gas concentration reading and/or a gas alarm.

Chapter 2 – Features

2.1 External Layout

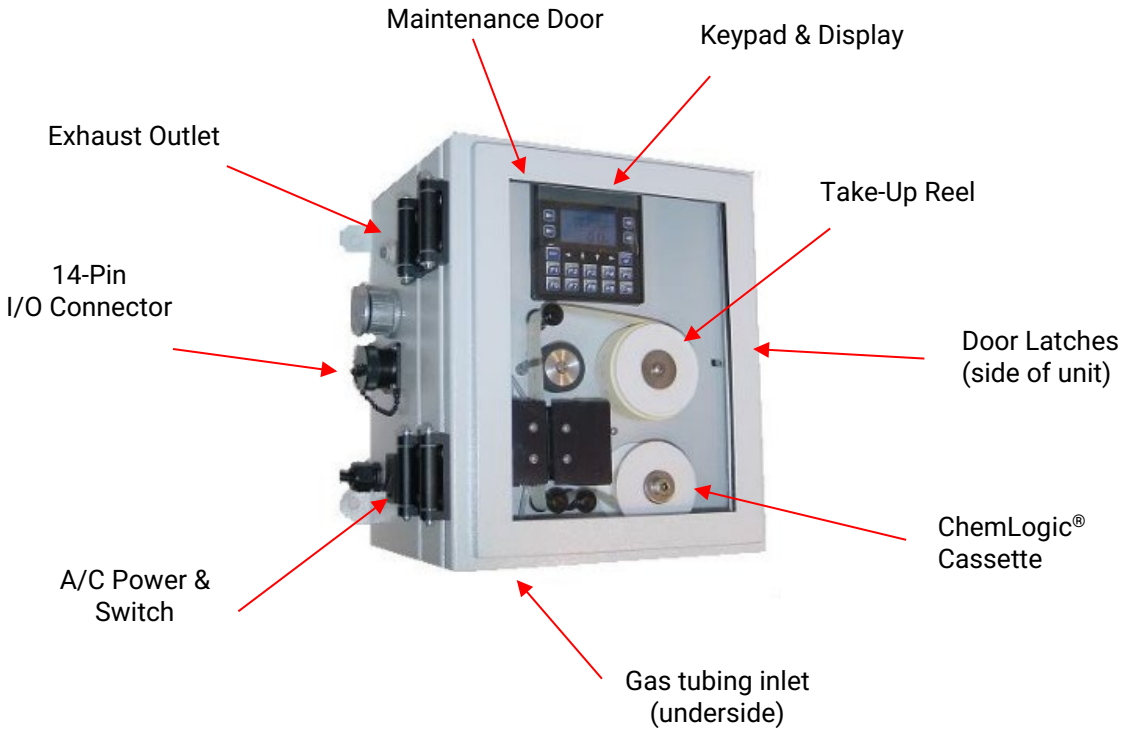


Figure. 2.1

2.1.1 Warning Labels, Descriptions, & Danger Zones

The table below references all warning labels and their meanings that may be encountered while operating and servicing the ChemLogic® CL1/CL2 continuous gas detection equipment.

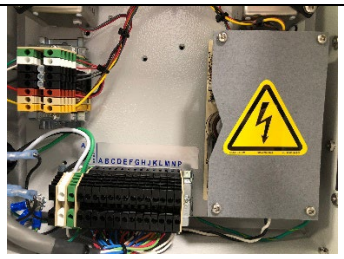
	WARNING: Hot Surface. This surface will be hot to touch and may cause injury. Please avoid or take caution when working near this zone.
	WARNING: Protective Earth Ground. Terminal Intended for connection to external conductor for protection against electric shock in case of fault.

	ATTENTION: Please read operator's manual for all instructions for this machine. If the manual is not in the country's native language, request an updated manual before using the equipment.
	WARNING: Electric Shock is possible, please use caution when accessing this zone.
	WARNING: Moving Parts and Hand Crushing are possible. Please watch hand placement when working near this zone.

2.1.2 ChemLogic® CL1/CL2 Danger Zones

Be mindful of the following danger zones on the ChemLogic® CL1/CL2 continuous gas detection equipment. Each zone contains warning labels for operator safety. Label meanings/descriptions can be found in the above table.

A 	WARNING: This danger zone is located on the right side of the unit. It is the warning for electrical shock in the following danger zone C.
B 	WARNING: This danger zone is located on the gate assembly. During operation, operators could pinch fingers if not aware of hand placement.

C		WARNING: This danger zone is in the interior of the unit after zone A. Operators could experience electric shock here if caution is not exercised.

2.1.3 Maintenance Door

The maintenance door allows easy access to the ChemLogic® Cassette and the display/keypad. The latches on the side of the unit are used to open & close/secure the door.

IMPORTANT: The maintenance door should remain closed and latched except when changing the ChemLogic® Cassette.

2.1.4 Keypad & Display

The CL1/CL2 uses a two-color LCD display with a 20-button keypad including 4 programmable “soft keys”. See Chapter 5 for a complete description of the use of the keypad and display.

2.1.5 ChemLogic® Cassette and Take-up Reel

ChemLogic® Cassettes are accessed by opening the maintenance door. Refer to Chapter 6 regarding cassette installation/replacement.

2.1.6 Gas Inlet & Exhaust

The gas being monitored flows through the inlet on the bottom of the unit, across the colorimetric cassette, and out the exhaust port on the side of the CL1/CL2. Sample tubing and exhaust use a quick connection system for simple installation. See section 3.3 for information on connecting the sample and exhaust tubing.

IMPORTANT: End-of-line filters are required. See Section 6.4.

2.1.7 A/C Power & Switch

A/C power is connected on the left side panel with a standard power cord. The on/off power switch is located adjacent to the power cord connection.

2.1.8 14-Pin I/O Connector

The connector on the side of the unit connects to alarm relays, fault relays, 4-20ma output, and the remote reset input.

2.2 Maintenance Area

The maintenance area allows easy access for changing ChemLogic Cassettes in the CL1/CL2. Figure 2.2 shows the internal layout with the access panel open. See Section 6.3 for cassette installation.

Figure 2.2

2.3 Internal Layout – Service Area

Internal access to the CL1/CL2 for service uses the latches located on the right side of the front panel. Figure 2.3 shows the internal layout of the CL1/CL2 with the service door open.

The door should be opened by trained service personnel (See Section 6.2)

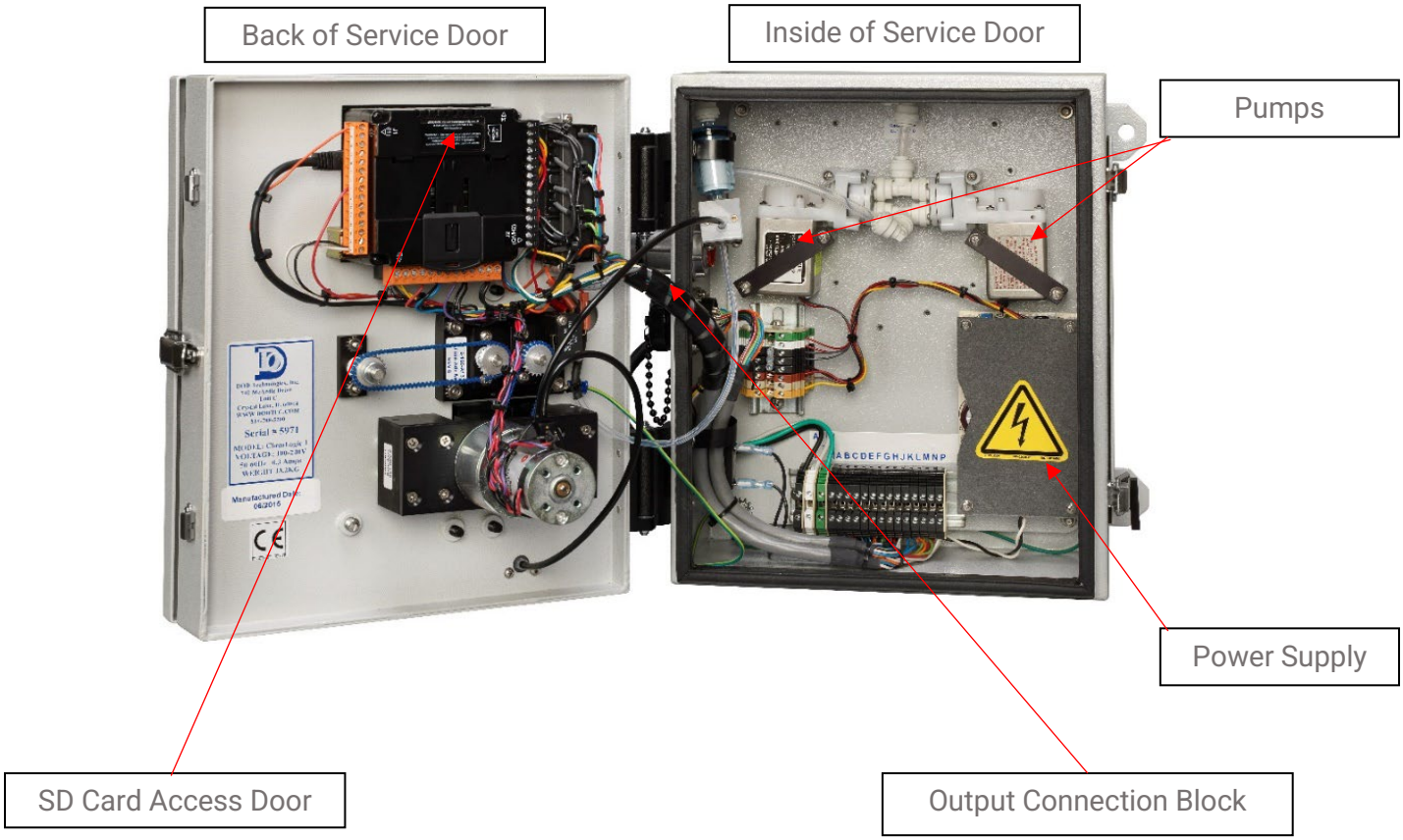


Figure 2.3

	DANGER: Turn off the unit, disconnect A/C power and unplug the 14 pin I/O connector on the side of the unit (if installed) before opening the service door.

2.4 Micro Secure Digital Card (SD Card)

The CL1/CL2 uses an SD card to store historical information including concentration logging, event history, configuration information, and TWA data. SD cards may be purchased through DOD Technologies – see Appendix A.

Chapter 3 – Installation

3.1 Selecting A Location

The CL1/CL2 should be placed in a location as central as possible to the locations being monitored while considering the following restrictions:

- The maximum sample line length is 150 ft. for all gases other than diisocyanates.
- Diisocyanates have a 6” maximum sample line length.
- Using the shortest possible sample line length will reduce the transport times of the CL1/CL2.
- A/C power is required for the unit.
- Locate near proper ventilation keeping in mind the maximum length of the exhaust tubing is 25ft.
- The CL1/CL2 requires stable temperature and humidity levels within range to operate properly (see Appendix C)

NOTE: Options are available for heating or cooling the CL1/CL2 – Contact DOD Technologies for details.

RECOMMENDATIONS:
Do not place in a location that will expose the CL1/CL2 to moisture, dust, corrosive gas, or any unusual environmental conditions which could damage the unit and/or cause it to operate inaccurately.

3.2 Mounting

Refer to Figure 3.1 for dimensional requirements for wall mounting. Be sure the CL1/CL2 is properly secured to the wall.

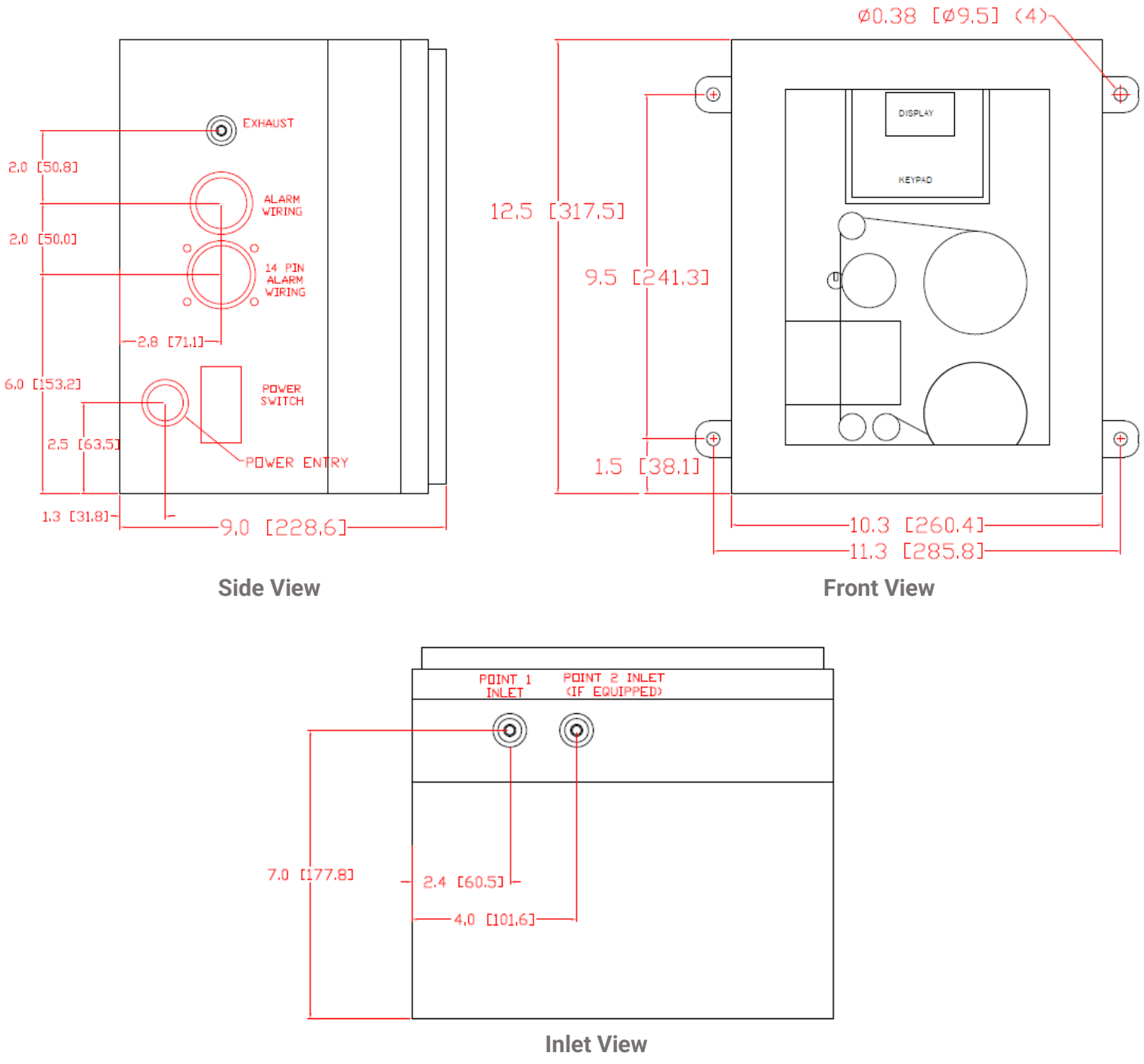


Figure 3.1

3.3 Sample Tubing

Sample tubing connects to the CL1/CL2 through the inlet on the bottom of the unit. (see Figure 3.2). Sample tubing must be FEP 1/4 OD x 1/8 ID (150 ft max length – 6" for diisocyanates) which may be purchased from DOD Technologies, INC (See Appendix A).

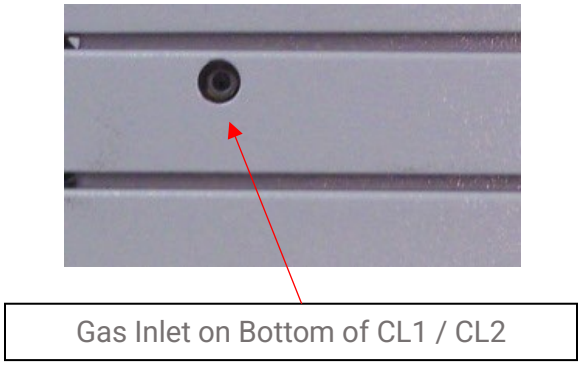


Figure 3.2

Fully depress the sample tube into fitting past the O-Ring when attaching. To detach the tube, push on the collet and pull the tubing out.

IMPORTANT**:** Sample tubing used with the CL1/CL2 must be 1/4" OD x 1/8" ID FEP. Use of any other tubing may damage the CL1/CL2 and/or cause inaccurate gas concentration readings.

3.3.1 End-of-Line Particulate Filters

An End-Of-Line Particulate Filter must be used on all gasses except diisocyanates to prevent loss of concentration. Filters require regular maintenance – see Chapter 6.

End of line particulate filters may be purchased from DOD technologies (see Appendix A)

IMPORTANT**:** The CL1/CL2 requires filtration to prevent dust accumulation in the tubing and internal damage to the unit. Dust that collects in the tubing or the internal system may cause sample loss and inaccurate gas concentration readings.

3.4 Exhaust Tubing

The exhaust line must be ¼"OD x 3/16" ID tubing with a maximum length of 25ft. Polyethylene is recommended although polypropylene or Teflon may also be used. Exhaust tubing may be purchased from DOD technologies (see appendix A)

3.5 A/C Power

A 6ft power cord is included – **DO NOT** use extension cords with the CL1/CL2. Longer cords are available from most electrical supply stores.

3.6 Output Wiring

The output relays for Alarm Level 1 and System Fault are rated at 6 amp maximum.
The 4-20mA output is adjustable within the CL1/CL2 to increase precision. When not in analysis the CL1/CL2 will output the 2ma calibrated value. There is a maximum of 500-ohm load impedance on the 4-20mA circuit.
See Appendix B for a listing of output module connections.

	DANGER: Turn off the unit, disconnect the A/C power and unplug the 14-pin I/O connector on the side of the unit (if installed) before any wiring modifications.

Chapter 4 – Setup & Configuration

4.1 User Checklist

Follow this checklist to configure the CL1/CL2 for first-time operation or after a software upgrade.

___ **Set passwords** (Section 5.6.3)

___ **Set system date and time** (Section 5.5.7)

___ **Gas selection** (Section 5.5.9)
Appendix E contains the specifications for each gas.

___ **Alarm level settings** (Section 5.4.5)

___ **Latching relays** (Section 5.5.3)

___ **Energized Relays** (Section 5.5.5)

___ **Idle Timeout** (Section 5.5.6)

___ **Testing Contacts** (Section 5.4.7)

___ **Adjustment of 4-20 ma** (Section 5.5.8)

___ **Install new ChemLogic Cassette** (Section 6.3)

___ **Install removable media** (Section 6.6)

___ **Format removable media** (Appendix F.3)

___ **Cassette Saver Mode** (TSM Section 5.5.)

___ **Grease the Gate Cam** (Section 6.7)

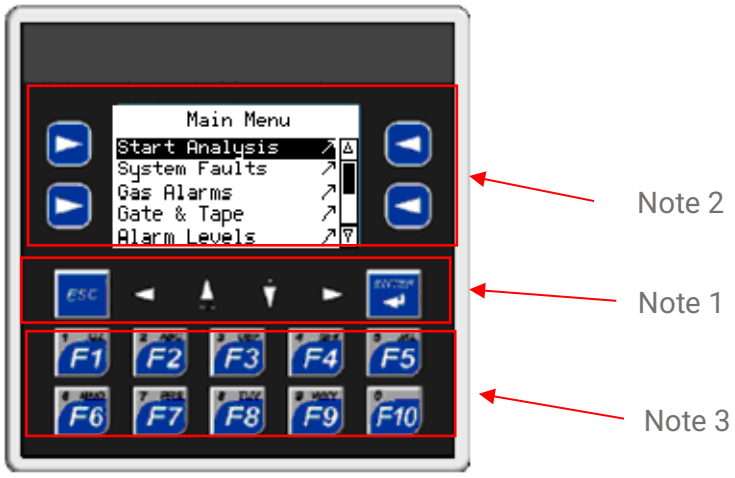
___ **Verify Sample Inlet flow (** post software upgrade only **)**

Setup complete - Ready for monitoring.

Chapter 5 – Basic Operation

5.1 Using the Keypad

The CL1/CL2 is controlled using the keypad located around the display. All the display screens are accessed through a simple menu system.



NOTE 1) The arrow keys located under the screen are used for two purposes.

1. To navigate through the menus using the <ENTER> key to select the highlighted item on the menu. In most cases the <ESC> key will exit the current screen and return to the top of the previous menu.

2. To select among multiple data fields on some of the screens for editing.

NOTE 2) The arrow keys on the sides of the display referred to as "**soft keys**" are used only when associated with a button on a screen. The use of these keys varies from screen to screen – see the detailed descriptions later in this chapter.

NOTE 3) When numeric entry is required on any screen the following procedure is used. Use the arrow keys below the screen to select which field to edit. The currently selected box will have a dashed line around it.

1 Press the <ENTER> key first
2 Use the numeric/function keys to enter the value
3 Also note the up arrow may be used for +/- and the down arrow may be used for the decimal point when necessary.
4 Press the <ENTER> key again to complete the entry

NOTE: The <F1> key is used to exit analysis and return to the Main Menu.

5.2 Alarm & Fault Screens

Three types of messages used in the CL1/CL2:
Alarm messages (level 1 and level 2)
System faults (critical faults that terminate and/or prevent analysis)
Event messages (warnings, non-critical faults, and various events)

See Appendix D for a description of each message. The history log always keeps the most recent 128 messages of any type in memory. All three types of messages are also logged to the Micro SD card if present.

Various screens are used in the CL1/CL2 to show some or all the messages (figure 5.2). Each of these screens work in a similar manner.

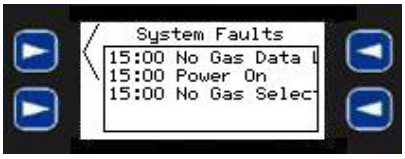


Figure 5.2

The arrow next to the upper left soft key indicates to press that key to view the full log. When the soft key is pressed a screen like Figure 5.3 will be displayed. Pressing the <ESC> key will return to the previous menu or screen.

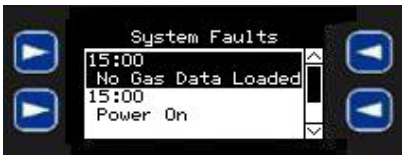


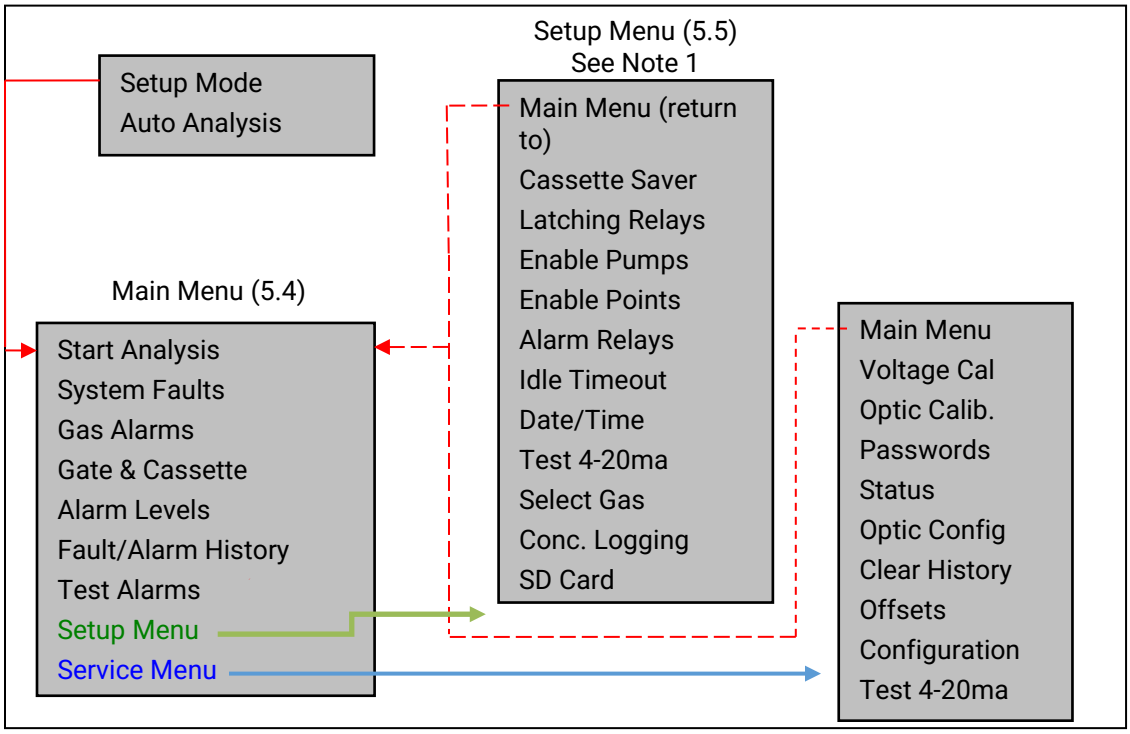
Figure 5.3

From the screen shown in Figure 5.3 the arrow keys below the screen allow scrolling of the messages in the log. On some of the fault/event screens the <F4> key will acknowledge all the current fault/events.

NOTE: The history log does not allow messages to be cleared. The details for each screen in Sections 5.4 – 5.6 will describe which keys may be used.

Pressing the <ESC> key once will return to the screen in Figure 5.2. Pressing the <ESC> key again from that screen will return to the previous menu or screen.

5.3 Menu Overview CL1/Cl2



Note 1: The setup menu is not password-protected by default.
Note 2: The service menu is password-protected by default.

Passwords can be changed/cleared in the Password screen on the Service Menu (Section 5.6.3)

5.4 Power-On Initialization

When the CL1/CL2 is powered on it will begin with an initialization screen (Figure 5.4) which is followed by the restart screen (Figure 5.5).

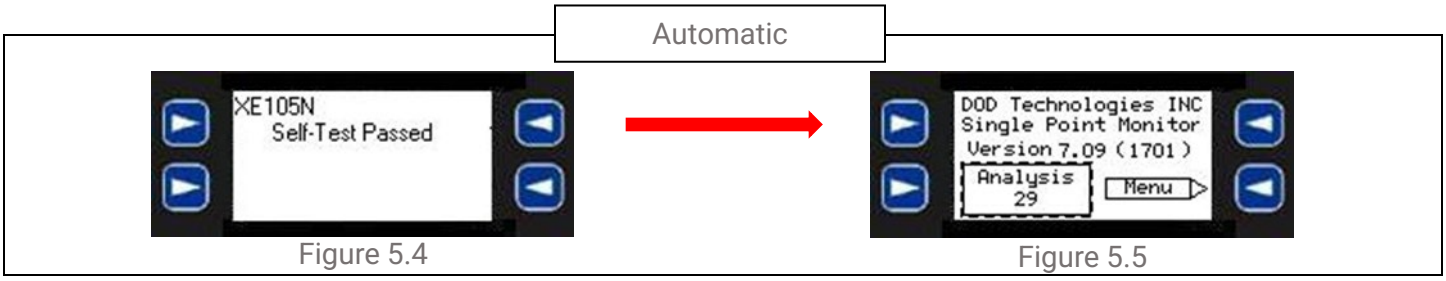


Figure 5.4 Figure 5.5

If the operator touches the <MENU> soft key before the timer reaches 0 the Main Menu (Section 5.5.1) appears otherwise after a timeout the system will automatically start analysis (Section 5.4.1)

5.5 Main Menu

Once the CL1/CL2 is configured the main menu contains all the screens necessary for normal operation. The main menu is not password-protected.

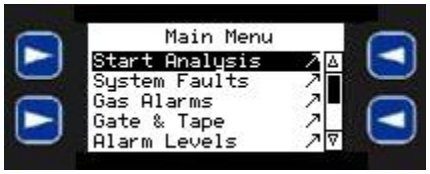


Figure 5.6

Each selection on the main menu is detailed below

5.5.1 Start Analysis

Selecting this menu item will bring up the analysis screen below and start gas analysis. Pressing <F1> during analysis will end analysis and return to the main menu.

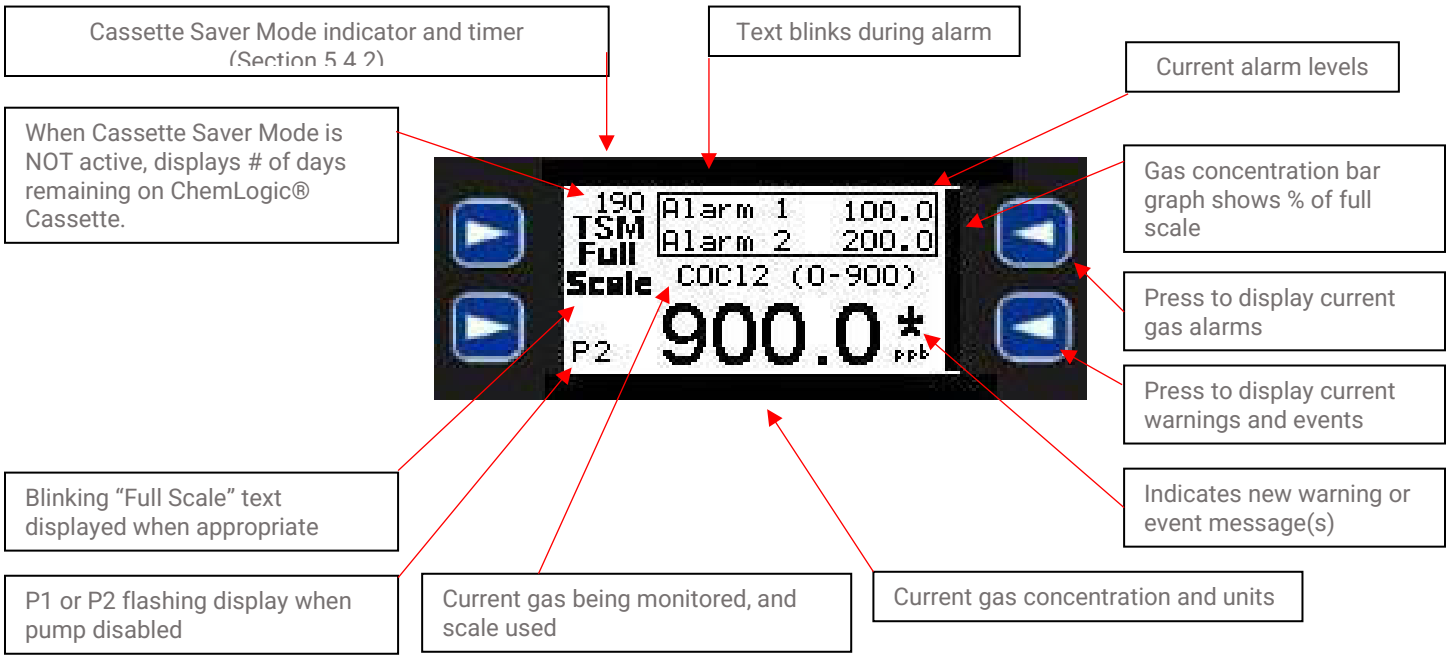


Figure 5.7

The screen continuously displays the current gas concentration if the system remains in analysis mode.

WARNING – Cassette Saver Mode may affect the display of actual gas concentration. See Section 5.5.2 for a complete explanation of Cassette Saver Mode (TSM).

When the concentration exceeds one or both alarm level text *"Alarm 1"* and *"Alarm 2"* will blink appropriately. Anytime Alarm 1 is active the concentration display will also blink. When the concentration passes the alarm

levels the corresponding alarm output relay is triggered. The trigger will remain set depending on the setting of Latching Relays – see Section 5.4.3.

The bar graph on the right side of the display reflects the % of full scale for the current concentration reading. At the lower left of the screen the display will show 'P1' or 'P2' if a pump is disabled either manually or automatically. See Section 5.4.4

During analysis the two keys on the right side of the display are active. When pressed the upper right key next to the alarm levels will display a screen showing the current alarm messages. Analysis remains active while this screen is displayed. If alarms are active, they may be cleared by pressing <F4> (see alarm screen operation in Section 5.3.6).

NOTE: If an alarm is cleared but gas is still present above the present alarm level the alarm will immediately trigger once again. Pressing <ESC> will return to the analysis screen.

An asterisk next to the lower right soft key indicates that there are new warning/fault messages. Pressing the key on the lower right next to the asterisk will display the messages while remaining in analysis mode. Any active warning/fault messages may be cleared by pressing <F4> (see alarm screen operation in section 5.3.6). Pressing <ESC> will return to the analysis screen.

5.5.2 System Faults

See section 5.2 for the use of the fault/alarm screens. The <F4> key is available to clear messages from the detail screen. The <ESC> key will return to the main menu.

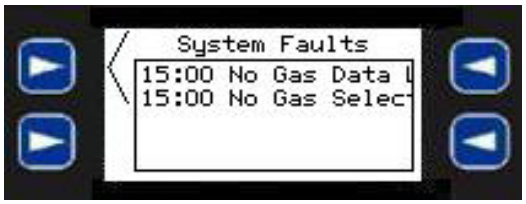


Figure 5.8

5.5.3 Gas Alarms

See Section 5.2 for the use of the fault/alarm screens. The <F4> key is available to clear messages from the detail screen. The <ESC> key will return to the main menu.

Figure 5.9

5.5.4 Gate & Cassette

Touch the lower left <GATE> soft key to open or close the gate. When a new ChemLogic Cassette is loaded press the <RESET> soft key to reset the counter for a new cassette. The cassette window's remaining display is the number of advances expected before the cassette is empty. This number is used to calculate the warning message "ChemLogic Tape Low". Press the <DONE> soft key to return to the main menu.

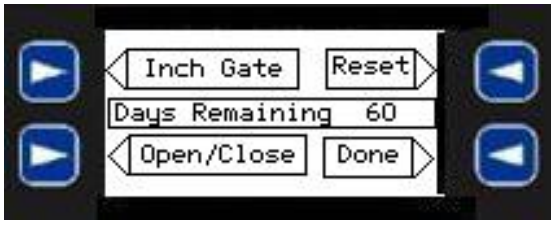


Figure 5.10

5.5.5 Alarm Levels

Use the arrow keys below the screen to select between Alarm 1 and Alarm 2. Notice the dotted line around the currently selected field. To enter a new alarm level, follow the procedure outlined in Section 5.1. There are several errors that can occur and will be displayed in the "Status Area" of the screen. Press the <DONE> soft key to return to the main menu.

Figure 5.11

5.5.6 Event & Alarm History

See Section 5.2 for the use of the fault/alarm screens. The messages shown in the history log cannot be cleared or acknowledged. The most recent 128 messages are contained in the history log. The <ESC> key will return to the main menu.

Figure 5.12

5.5.7 Test Alarms

Use the <ALARM 1>, <ALARM 2>, and <FAULT> soft keys to turn the output relays on and off. When the <Done> soft key is pressed all the faults are automatically reset.

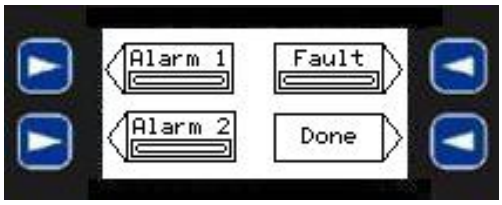


Figure 5.13

5.6 Setup Menu

The Setup Menu contains the screens necessary to configure the CL1/CL2 for operation. The setup menu is not password protected by default but may be password protected (see service menu).

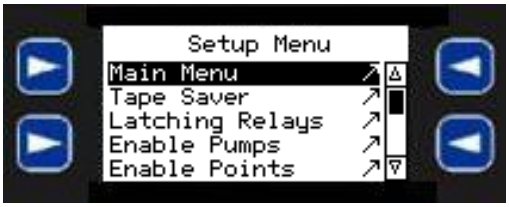


Figure 5.14

Each selection on the setup menu is detailed below

5.6.1 Main Menu

Selecting this menu item will return to the main menu (Section 5.4)

5.6.2 Cassette Saver

(Default Configuration: Disabled)

Cassette Saver Mode is used to reduce cassette advancement during a gas release. Three Cassette Saver Modes are available on the CL1/CL2: Fixed Cycle mode *(Default)*, Single Reading, and Continuous. Use the upper left soft key to select among the three modes.

DANGER**:** Make sure the Cassette Saver Modes are completely understood before enabling. Cassette Saver modes allow the operator to bypass continuous gas monitoring.

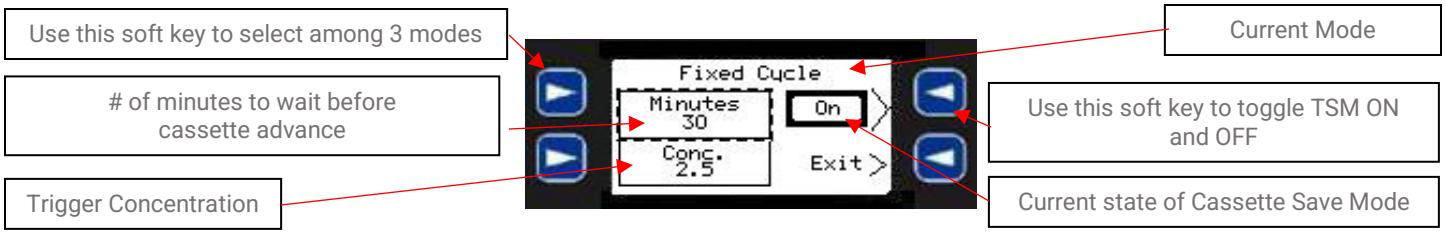


Figure 5.15

In Fixed Cycle mode, the Minutes entered on the screen is the MINIMUM time each cycle will take regardless of whether gas is detected or not. The maximum time of the cycle is the normal cycle time of the CL1/CL2 cassette being used (normally approx. 54 minutes). Enter the # of minutes (1-54) which will be the minimum time before cassette advance. If gas is detected and the cassette becomes saturated in less than the time specified, the system will wait until the cycle time is complete before advancing. When this occurs the timer on the Analysis screen will begin counting down the number of seconds remaining until the cassette advances. **In Fixed Cycle Mode the concentration level is not used and will always show a non-zero value.**

In Single reading mode, the time specified (minutes) is the exact analysis cycle time. At the start of each cycle the system will take 1 reading and report the concentration (including zero). The timer will then continue to countdown to zero before advancing to the next cycle. **In Single Reading Mode the concentration level is not used and will always show 0.**

In Continuous mode both the time (minutes) and the conc. level are used. If the concentration should reach the level specified, the timer will start and count down from the time specified to zero before advancing the cassette.

WARNING – When Cassette Saver Mode is active the actual gas concentration may not be displayed. Anytime the counter (in seconds – see Figure 5.16) is counting down to zero NO ANALYSIS IS BEING PERFORMED and the concentration displayed may not be accurate.

While Cassette Saver Mode is enabled the letters 'TSM' will always appear on the analysis screen.

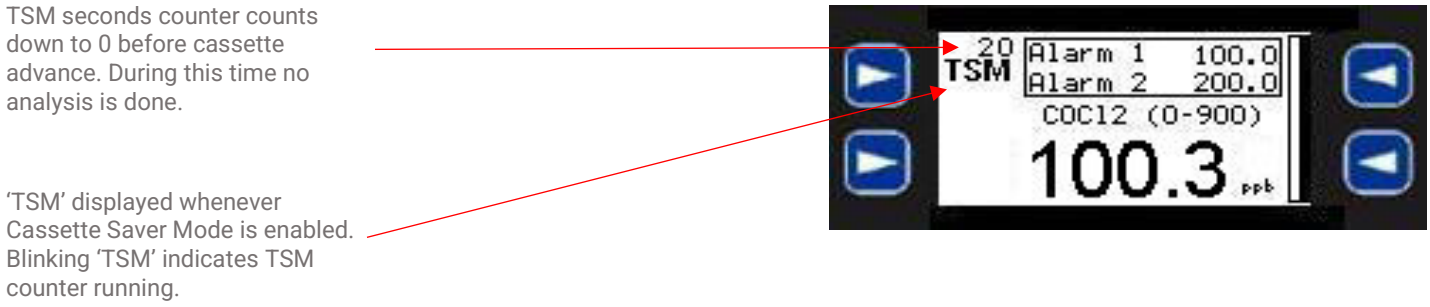


Figure 5.16

Example using Figures 5.15 and 5.16: When the values displayed in Figure 5.15 are entered and TSM is enabled (ON), a gas concentration reading of 100.3 would start the TSM counter and freeze the concentration reading at 100.3 ppb. (see Figure 5.16) Regardless of the amount of gas present during this time the counter

will start at 300 seconds and countdown to 0 before advancing the cassette and calculating a new gas concentration.

After the cassette advances, the CL1/CL2 will again monitor for gas and display the calculated value. If the new calculated value is below the TSM concentration the concentration displayed will begin to update appropriately. Once the gas concentration reaches 100.0 the timer will start again, and the value will remain at the last calculated concentration.

5.6.3 Latching Relays

(Default Configuration: ON)
Press the upper left soft key to toggle the latching relays on and off. The display adjacent to the soft key always displays the current state of the relays (ex: in Figure 5.17 the relays are currently non-latching).

Figure 5.17

Latching relays will cause a gas alarm relay to remain active even if the gas concentration drops below the alarm level until it is acknowledged. If the relays are set to non-latching the output the relay outputs will toggle on and off as the gas concentration goes above and below the corresponding alarm level.

5.6.4 Enable Pumps

(Default Configuration: Enabled)
Press the upper soft keys to toggle between enabled/disabled on the corresponding pump. The display adjacent to the soft key always displays the current state of the pump. (ex: in Figure 5.18 both pumps are currently enabled). When a pump is disabled a flashing 'P1' or 'P2' corresponding to the disabled pump will appear in the lower left corner of the analysis screen. (See Section 5.4.2) Disabling both pumps will trigger a critical system fault and prevent analysis mode.

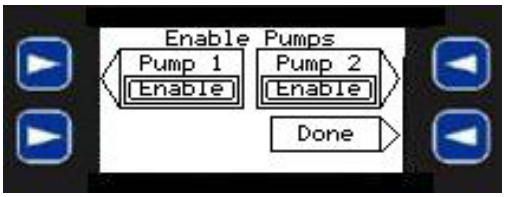


Figure 5.18

5.6.5 Enable Points

(Only Available on CL2)
Like the Enable Pumps screen, this screen will allow either point on a CL2 to be enabled/disabled.

5.6.6 Energized Alarm Relays

(Default Configuration: OFF)
Use the upper left soft key to select Energize/De-Energized alarm relays. The soft key always shows the CURRENT state of the relays. The initial default value is Energized.

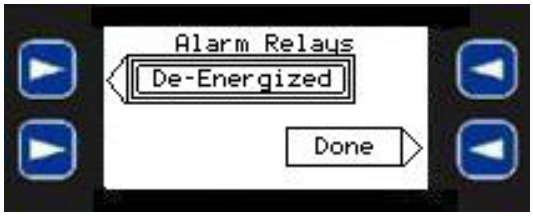


Figure 5.19

5.6.7 Idle Timeout

(Default Configuration: 45 Minutes)
Enter the number of minutes before an 'Idle Timeout Fault' occurs. When the system is out of analysis for the specified amount of time the fault will occur. Specifying zero (0) minutes will disable the fault from occurring. The maximum amount of time allowed is 45 minutes.

Figure 5.20

5.6.8 Date and Time

Use the arrow keys below the screen to select among the date & time fields and enter the values using the procedure outlined in Section 5.1.3. **The <SET> soft key must be pressed to apply the changes that are entered.**

Figure 5.21

5.6.9 Test 4-20mA

Use the soft keys to select 2 mA, 4 mA, or 20 mA which will bring up the screen in Figure 5.23 AND set the 4-20mA output to the corresponding level. Using the "-" or "+" soft keys the output value can be adjusted as needed for the selected level. The adjusted value is automatically saved each time the "-" or "+" soft key is used. The new values are permanently stored in the CL1/CL2 and used in the 4-20mA scaling for gas concentrations.

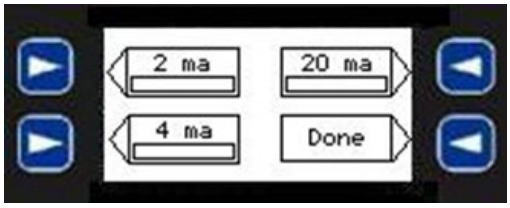


Figure 5.22

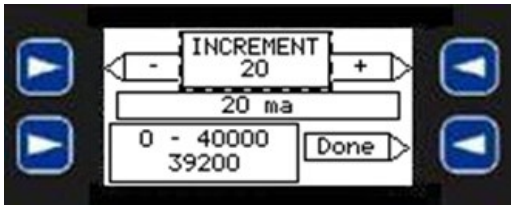


Figure 5.23

The following table summarizes the analog output values with consideration of the Idle Output settings for various CL1/CL2 statuses:

CL1/2 - Analog Output w/ Consideration to Idle Setting		
Status	**Idle Setting @ 2mA**	**Idle Setting @ 4mA**
Idle	2mA	4mA
Analysis - No Gas (point specific)	4mA	4mA
Analysis - Full Scale (point specific)	20mA	20mA
Disabled Point - Idle	2mA	4mA
Disabled Point - Analysis	4mA	4mA
Critical Fault	2mA (all points)	2mA (all points)

Table 5.6.9

5.6.10 Select Gas

Selecting this menu item will display the gas selection shown below in Figure 5.24. Press any of the 3 indicated soft keys to select the gas & range. The <ESC> key will return to the setup menu.

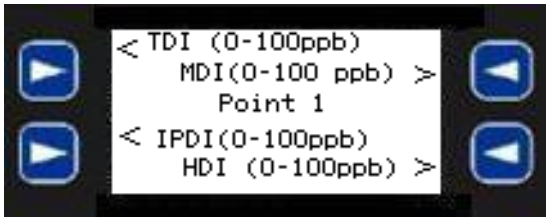


Figure 5.24

5.6.11 Conc. Logging (Concentration Logging)

Selecting this menu item will display the screen shown below in Figure 5.25. You can select between “All Conc. > 0” (default) and “Alarm Level 1”. Selecting the first choice will cause the system to log all concentrations detected. Selecting the latter will only log concentrations >= Alarm Level 1, The <ESC> key will return to the setup menu.

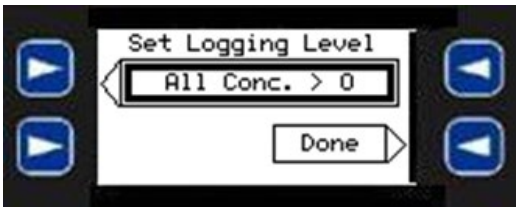


Figure 5.25

Figure 5.26

5.7 Service Menu

The Service menu is intended for client use but should remain password-protected to prevent unauthorized access. The default Service Menu password is included with this manual. The password can be changed as needed (see Section 5.6.3)

5.7.1 Voltage Cal

This menu item is for Factory or Service personnel use, under normal conditions this screen is not used. Hit <Cancel> to return to the Service Menu.

5.7.2 Optic Calibration

This screen is used to manually calibrate the optics which normally only needs to be done when the system is first configured. Touch the <Start> soft key to start the calibration process. When the process starts the DAC & Ref values will be set to 0. When the process completes both values will update with non-zero values indicating that the process is complete.

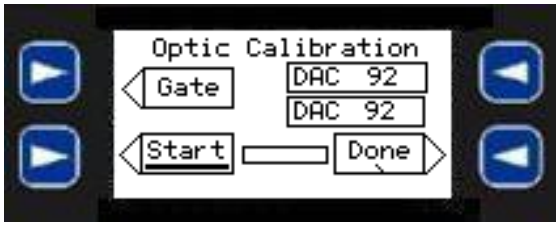


Figure 5.27

5.7.3 Passwords

This screen is used to change the passwords for both the Setup Menu and Service menu. A password of 0 will disable the password feature for the specified menu. The default passwords are included with this manual.

Figure 5.28

WARNING – Be sure to keep the Service menu password in a safe place. If the service password is lost, you will no longer be able to access the service menu and may need to restore default.

Use the arrow keys below the screen to select among the password fields and enter the values using the procedure outlined in Section 5.1.3. The passwords are automatically saved and set to the value displayed.

5.7.4 Optic Config

Selecting this menu item will display a screen of values that may aid service personnel in verifying the optic system. Under normal conditions the screen is not used. Hit <ESC> to return to the Service Menu.

5.7.5 Status

Selecting this menu item will display a screen of values that may aid service personnel in finding system faults some of which may be edited in the screen. Under normal conditions, the screen is not used. Hit <ESC> to return to the Service Menu.

5.7.6 Clear History

The history screen contains the 128 most recent event, fault, and alarm messages. Each of the messages logs the date/time occurred and the date/time cleared as separate entries. In the "Event/Alarm History" on the Main Menu (Section 5.4.6) it is not possible to clear the history. By using this screen, the history may be cleared if necessary. Use the same procedure used in the alarm and fault screens to clear the entries. Press the soft key next to the arrow then press <F4> to clear. <ESC> will then bring back the screen in Figure 5.28 and <ESC> again to return to the Service menu.

Figure 5.29

WARNING – Clearing the history log is not recommended. There is no way to recover the entries after they have been cleared.

5.7.7 Configuration

The configuration menu is for certified service personnel only.

Chapter 6 – Maintenance

For safety purposes, it is recommended that the ChemLogic® CL1/CL2 continuous gas detection system be serviced on-site every 6 months by a certified DOD Service Technician or by submitting the unit to the manufacturer for routine maintenance. A certificate of repair should be received and kept with the operation documents of the machine. Any malfunctions in the device should be reported and corrected before further use.

For Permanent discontinuation:
Please contact DOD Technologies for the safe return of your equipment. All discontinued units will be accepted back by DOD Technologies so proper recycling may take place. For information on how to return the unit contact us using the below information:

6.1 Maintenance Door Access

The maintenance door is used to access the ChemLogic® Cassette and the display/keypad. To open the maintenance door, release the middle latch on the side of the CL1/CL2 as shown in Figure 6.1. When maintenance is complete be sure to close the maintenance door and secure the latch.

IMPORTANT: The maintenance door should always remain securely latched except when servicing the ChemLogic Cassette or using the keys on the display.

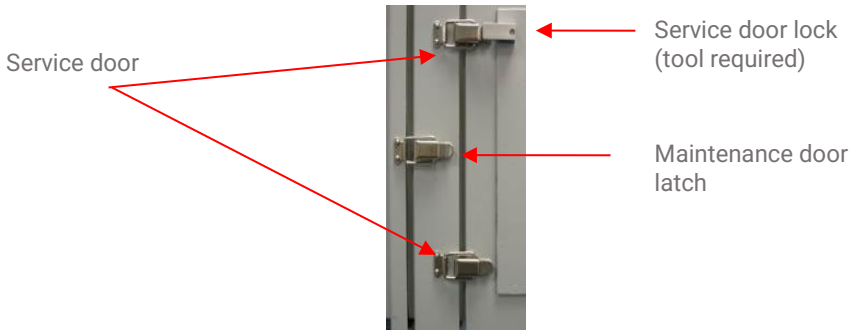


Figure 6.1

6.2 Service Door Access

	DANGER: Service must be performed by trained personnel only. Turn off the unit, disconnect A/C power and unplug the 14 pin I/O connector on the side of the unit (if installed) before opening the Service Door.

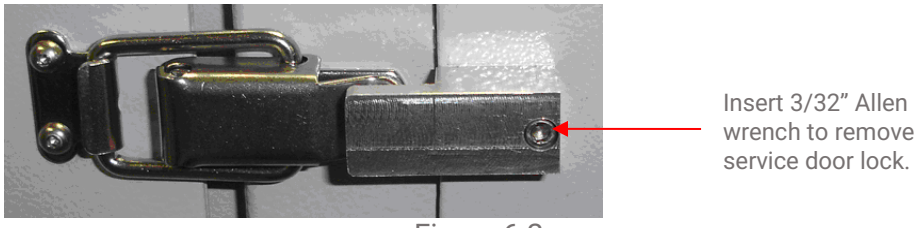


Figure 6.2

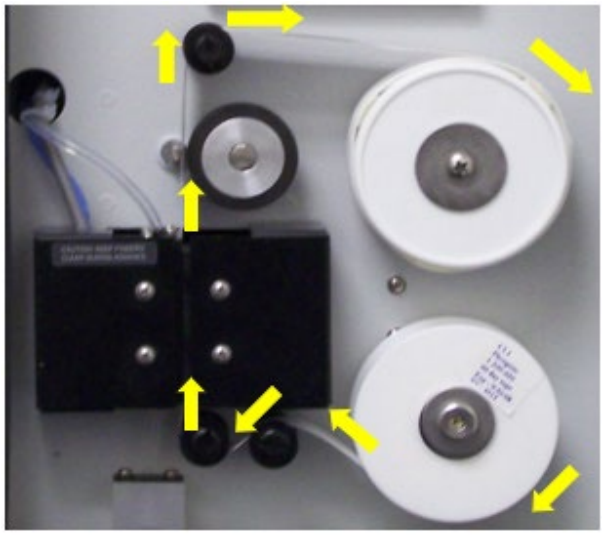
Before opening the service door, ensure the maintenance door is securely latched and the power is removed. The service door safety lock must be removed with a 3/32" Allen wrench before the service door can be opened. (Figure 6.2) Release the top and bottom latches on the side of the CL1/CL2 as shown in Figure 6.1 to open the service door. When service is complete be sure to close the service door and secure all latches on the side of the unit. Then reinstall the service door safety lock and tighten it securely.

IMPORTANT: The service door must always remain securely latched with the safety lock installed when not servicing the unit. Verify that both latches are secured and that the safety lock is installed, to prevent unauthorized access.

6.3 ChemLogic® Cassettes

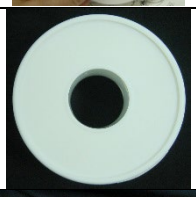
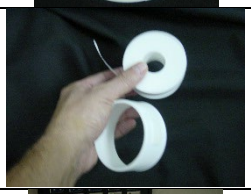
ChemLogic® Cassettes have an expiration date printed on the label. Expired cassettes should be disposed of and replaced with new cassettes to ensure proper gas concentration readings. ChemLogic Cassettes from DOD Technologies will last for the specified number days under normal usage. See Appendix A for ordering information.

IMPORTANT: Read Appendix G before handling ChemLogic® Cassettes.



ChemLogic Cassette Path
Figure 6.2

Review the colorimetric tape path from the cassette, shown in Figure 6.2
Open the maintenance door. (Section 6.1)
Select Gate & Cassette from the main menu (Section 5.5.4)
Scroll down with the arrow keys and select "Gate & Cassette"
Touch the <Open/Close Gate> soft key to open the gate.

	Remove the top tape sleeve with the tape spooled around it by gently pulling away from the machine.
	Remove the old tape reel from the bottom spindle by lifting over the washer. Discard the old cassette appropriately
	Remove the new cassette reel from the protective packaging.
	Pull the sleeve off the new cassette reel and place the reel on the bottom spindle.
	Place the new sleeve on the top reel.
	Feed the new colorimetric tape through the system as shown in Figure 6.2 Verify the tape position on all rollers before proceeding.
	Fold the end of the colorimetric tape and loop it through the spool bar.
	Backside image of tape fold and insertion under the spool bar.
	Turn the top spindle a full turn to secure the colorimetric tape.

Press the gate button several times to make sure the cassette is advancing properly.
On the screen touch the 'Reset' soft key. (See Section 5.5.4)

WARNING**:** Keep fingers clear during cassette advance.

6.4 End-Of-Line Particulate Filters

End-Of-Line Particulate Filters – which protect the system and sample tubing from particulates – are required on all points, including points not being monitored. **Dirty sample tubing and/or dirty end-of-line filters can inhibit and/or slow gas response.** The following figure details the type of filter required for each gas. Filters must be replaced regularly as indicated. Filter orientation is not critical in either application.

> **IMPORTANT** : All points require filtration to prevent dust accumulation in tubing and internal damage to the system. Dust that collects in the tubing or the internal system may cause sample loss and inaccurate gas concentration readings.

Gas	Description	Suggested Replacement	DOD Filter Part No.
	Diisocyanates***	2 Months	2-600-217 (Housing) + 2-600-207 (Membrane)

Table 6.1

***Filter for Diisocyanate detection is not required. Please call customer service for more information on applications using this filter.

		
A - Filter For Corrosive Gases Recommended membrane replacement every 30 days, depending on conditions. The internal housing body should be cleaned annually. Part Numbers: Blue Housing: **60009** Filter Membrane: **60010**	**B** - Disposable Filter For Corrosive Gases Recommended replacement every 3-6 months, depending on conditions. Part Number: **2-800-013** (Filter can be interchanged with 60009 / 600010)	**C** – Disposable Filter For Non-Corrosive Gases Part Number: **780248** (Replacement recommended every 6 months)
Target gases include: **Mineral Acids** **Oxidizers (excluding NO2)** **Ammonia (NH3)/Amines** **Hyrdazine (N2H4)** **Nitrogen Fluoride (NF3)** Please contact us if you have questions concerning which filter(s) to specify for a specific target gas.		Target gases include: **Hydrides** **Phosgene (COCL2)** **Nitrogen Dioxide (NO2)** Please contact us if you have questions concerning which filter(s) to specify for a specific target gas.

Table 6.2

6.5 Flow Adjustment

The pumps in the CL1/CL2 automatically adjust to keep a constant flow to the system. No manual adjustment is necessary. The typical inlet flow rate should read between 700 – 1000 cc's per minute. A ChemLogic® Cassette must be installed when adjusting flow manually.

6.6 Micro Secure Digital (SD) Card Replacement

See Appendix F for detailed information on the contents of the SD Card.

To install a Micro SD card: Align its 8-pin gold edge connector down, facing the front of the CL1/CL2 unit as shown in Figure 6.3; then carefully push it all the way into the Memory slot. Ensure that it clicks into place. To remove the Micro SD card: Push down on the top of the card gently to release the spring. The card pops up for removal. Make sure to format the SD card before first use whenever a new card is purchased.

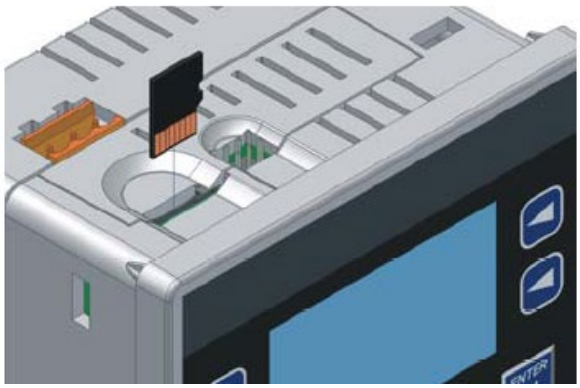


Figure 6.3

When the Micro SD card format was introduced, it was originally called TransFlash. Cards labeled either Micro SD or TransFlash, with up to 2.0 GB of Flash memory, are compatible. The CL1/CL2 memory slot is equipped with a "push-in, push-out" connector and a Micro SD card can be safely inserted into the Memory slot whether the CL1/CL2 is powered is On or Off.

The CL1/CL2 Micro SD Memory slot uses the PC-compatible **FAT16** File System. You must format all SD cards before use with the FAT16 format. – See Appendix F.3

NOTE: Micro SD disks formatted with the **FAT32 file system will not work** in the CL1/CL2. **Appendix F** details the data stored on the SD card and how to access it on a personal computer.

6.7 Fuse Replacement

The system power is fused with a 3.15A Slow Blow 5X20MM fuse shown in Figure 6.4.

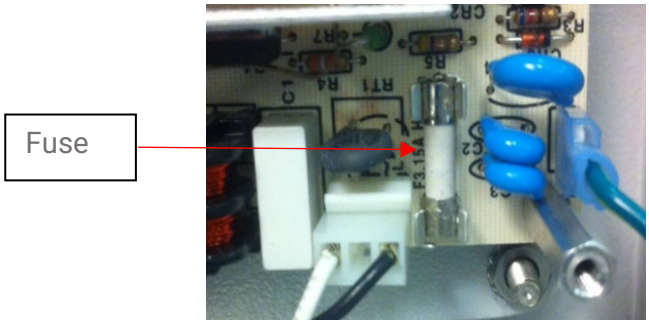
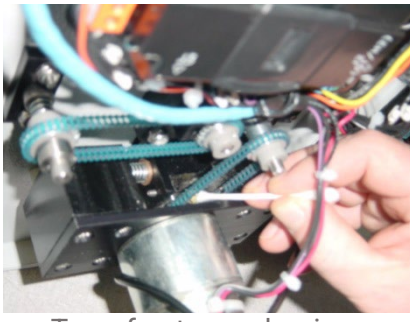


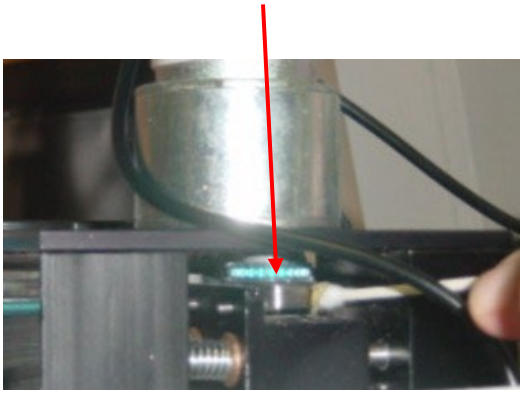
Figure 6.4

6.8 Grease Application

The cam attached to the gate motor should be greased every 6 months to prevent wear. Apply a small amount of number 2 type petroleum or synthetic grease to the rounded portion of the cam. See Figures 6.5 below:



Top of gate mechanism



Bottom of gate mechanism

Figure 6.5

Chapter 7 – Service & Support

For information on service and support contact DOD Technologies via the means below.

For Permanent Discontinuation:
Discontinued units can be returned for recycling. Please contact DOD Technologies to discuss and arrange the safe return of your equipment.

Phone Support
M-F 8:30am – 5pm (Central Time Zone)
815.788.5200

Service Center
675 Industrial Drive Bldg. A.
Cary, IL 60013

Visit Our Website
DODtec.com

Appendix A – Accessories & Spare Parts

ChemLogic® CL1/CL2 60-Day Cassettes	
1-700-020	Ammonia 60-Day Cassette; Detects: DMA, NH3, TDMAT, TMA
1-490-020	Bromine/Acetic Acid 60-Day Cassette; Detects: Br2, CH3COOH
1-300-022	Carbonyl Sulfide 60-Day Cassette; Detects: COS
1-500-020	Chlorine Oxidizer 60-Day Cassette; Detects: ClO2, F2, NO2
1-560-024	Chlorine SG 60-Day Cassette; Detects: Cl2
1-600-020	Diisocyanate 60-Day Cassette; Detects: HDI, HMDI, IPDI, MDI, NDI, TDI
1-D11-020	Hydrazine 60-Day Cassette; Detects: N2H4
1-300-020	Hydrides 60-Day Cassette; Detects: AsH3, B2H6, GeH4, H2S, H2Se, PH3, SiH4
1-600-040	Methyl Isocyanate 60-Day Cassette; Detects: MIC
1-420-120	Mineral Acid SG 60-Day Cassette; Detects: BF3, C4F6, CH2F2, CH3F, HBr, HCl, HF, H2SO4
1-200-020	Phosgene 60-Day Cassette; Detects: COCl2
1-700-040	TDA 60-Day Cassette; Detects: TDA
1-E15-020	TDI & MDI SPXNO2 60-Day Cassette; Detects: MDI-SPXNO2, TDI-SPXNO2
ChemLogic® CL1/CL2 30-Day Cassettes	
1-500-024	Chlorine Low-Level 30-Day Cassette; Detects: Cl2
1-600-022	Diisocyanate High Humidity 30-Day Cassette; Detects: HDI, HMDI, IPDI, MDI, NDI, TDI
1-800-020	Hydrogen Cyanide 30-Day Cassette; Detects: HCN
1-810-020	Sulfur Dioxide 30-Day Cassette; Detects: SO2
1-E15-022	TDI & MDI SPXNO2 High Humidity 30-Day Cassette; Detects: MDI-SPXNO2, TDI-SPXNO2
ChemLogic® CL1/CL2 – Filters & Tubing	
780248	Particulate Filter for Non-Corrosives (Phosgene & Hydrides)
2-800-007	Duct Mounting Kit for 1/4" Sample Line Tubing
2-800-013	Particulate Filter for Corrosive Gases (Mineral Acids)
2-800-008	KIT Duct Mounting Kit for 3/8" Tubing
2-500-502	47mm Teflon Membranes (Pack of 10) - use with P/N 60009
2-600-217	CL1 Option Dust Cone for Diisocyanate Applications
2-600-207	Filter Media Disc for Dusty Iso (Pack of 10) - use with P/N 2-600-217
2-500-052	Pyrolyzer Freon Filter
60009	Filter Housing for Teflon Membranes (Mineral Acids)
2-100-A36	CL1 Upper Fitting and Filter Assembly
2-100-503	Filter for H2S Scrubber
60010	47mm Teflon Membranes (Pack of 100) - use with P/N 60009
2-400-007	Tubing FEP 1/4 OD x 1/8 ID x 100'
14249	250 ft. FEP Teflon Tubing (3/16 ID x 1/4 OD)
77347	500 ft. FEP Teflon Tubing (3/16 ID x 1/4 OD)

48423	Tubing FEP 1/4 OD x 3/16 ID x 1000’
2-400-008	Tubing Exhaust 1/4 OD x 0.17 ID Polyethylene
ChemLogic® CL1/CL2 – Options & Accessories	
2-600-214	Outdoor Rain Resistant End of Line Cone
2-600-202	SD Micro Memory Card (2GB)
2-600-204	CL1 14-Pin Mating Connector
2-600-201	SPM Conversion Adaptive Mounting Kit
2-600-213	CL1 Light Extension Cable (up to 100') - Specify Length
2-600-208	CL1 Carrying Handle
2-600-212	CL1 Viton Flow Upgrade
2-600-216	CL1 Split Sampling System
2-600-211	CL1 Maintenance Relay
2-600-205	CL1 Self-Cleaning Optics
2-600-203	Side Mounted Stack Light with Audible Alarm
2-600-225	CL1 Color HMI Controller Upgrade for New Units
2-600-226	CL1 Remote Light Tower with Pole Mount
2-600-220	CL1 Explosion Safe (Zone 2) Top-Mount Light Tower
2-600-223	CL1 Color HMI Controller Upgrade for Existing Units
2-600-206	CL1 Z Purge with Form C Contact Closure (Class I, Div 2)
2-600-021	CL1 Performance Upgrade with New Pumps and Extended Warranty
2-600-219	CL1 YZ Purge Option with ATEX
2-100-075	CL1 Secondary Enclosure (NEMA4X with Cooler & Heater)
SP2105-PHO	Stack Pack Wet Scrubber Drying System (120VAC/Instrument Air Needed)

NOTE: All applications except diisocyanates – 150’ Maximum Sample Length. Diisocyanates – 6” Maximum – Sold in 100-foot increments.

ChemLogic® CL1/CL2 – Spare Parts	
102531	Fuse 3.15A Slow Blow 5X20MM
2-100-A37	Assy CL1 Cassette Guide (for CL1 units only)
2-100-A78	Tubing Assy CL1 Optics Exhaust
2-800-124	SHAFT CL1 BACK PLATE ALIGNMENT
2-800-122	SHAFT OPTICS ALIGNMENT
2-100-A34	Assembly Tee Fitting with Double O-rings & w/2 Collets Removed
2-200-030	Relay Form C 12VDC Coil
2-100-039	CAM WEAR PLATE
780248	Particulate Filter for Non-Corrosives (Phosgene & Hydrides)
2-100-067	COVER Optics Block CL1 CL8
2-100-A29	Assy One way Bearing w/Block
2-100-A26	Micro Switch Assembly Field Upgrade
2-300-009	Drive Belt 73 Links CL1

2-300-008	Drive Belt 84 Links CL1
2-200-028	Switch Rocker SPST 15A Sealed
2-100-061	CL1 Service Door Lock
2-100-010	Cover CL1 Optics Block Back Plate
2-300-004	Gear 24 Teeth Take-Up
2-100-A27	Transducer Assembly w/ Wires
2-600-217	CL1 Option Dust Cone for Diisocyanate Applications
2-600-214	Outdoor Rain Resistant End of Line Cone
2-100-041	CAPSTAN FULL ROTATION - Rev C
2-600-207	Filter Media Disc for Dusty Iso (Pack of 10) - use with P/N 2-600-217
2-100-A64	Assy CL1 - Inlet Manifold - Rev B per ECR 46
2-600-202	SD Micro Memory Card (2GB)
2-100-A30	Assy CL1 CL8 Drive Roller w/Shaft
2-600-204	CL1 14-Pin Mating Connector
2-100-A18	CL1 Optics Back Plate with Sealing Foam
104213	CM4 Power Supply 5-12 VDC
2-100-002	CL8 and CL1 CPU PCB ASSY
2-100-A36	CL1 Upper Fitting and Filter Assembly
2-100-A13	CL1/CL8 Cassette Advance Assembly
2-100-001	CL8 and CL1 LED Detector ASSY
870328	Pump CL1/SPM Standard
2-100-A17	Optic Block with Coating - Rev B
2-600-209	CL1 ModBus/TCP Option
2-100-A12	Assy CL1 Light w/Pole for Light Option w/6 Pin Connector
2-100-A24	Assy CL1 Light w/Pole for Light Option w/6 Pin Connector
2-100-A25	CL1 (ONLY) Optic Block Assembly
2-200-024	CL1 HMI Controller (requires s/w download)
2-100-A69	CL1 Optic Block - Self Cleaning Option
2-600-226	CL1 Remote Light Tower with Pole Mount
2-600-223	CL1 Color HMI Controller Upgrade for Existing Units
2-600-219	CL1 YZ Purge Option with ATEX
9-300-059	Synthetic Grease

Appendix B – I/O Connection Detail

14-Pin Cl1/Cl2 I/O Connector

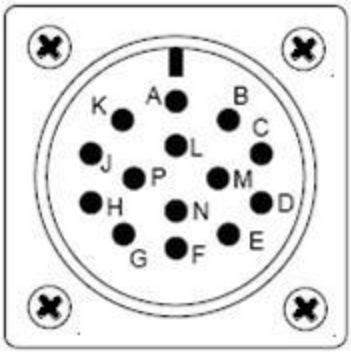


Figure B.1

Pin	Description	Usage
A	System Fault	Normally Open
B	System Fault	Common
C	System Fault	Normally Closed
D	Gas - Alarm Level 1	Normally Closed
E	External Fault Alarm Reset	Momentarily connect to pin N for reset
F	Gas - Alarm Level 1	Common
G	Gas - Alarm Level 1	Normally Open
H	4-20 ma	Positive (500-ohm max impedance)
J	Ground	
K	4-20 ma	Negative (500-ohm max impedance)
L	Gas - Alarm Level 2	Normally Closed
M	Gas - Alarm Level 2	Common
N	External Fault Alarm Reset	Momentarily connect to pin E for reset
P	Gas - Alarm Level 2	Normally Open

NOTE: The System Fault relay is always energized except when a fault is detected. The alarm fault relays are configured for energized or de-energized on the Setup Menu.

NOTE: The 4-20mA wiring requires a 2-wire shielded cable and the shield must be attached (grounded) to the metal shell of the mating housing (DOD 2-600-204) to prevent EMI interference.

NOTE: If the “Positive Pressure Sample Option” is installed, pins L, M, & P can be used to control a solenoid valve that will activate whenever the pump is not powered

Appendix C – System Specifications

Dimensions & Specs	
Height	12.5” (31.75 cm)
Width	10.25” (26.04 cm)
Depth	9” (22.86 cm)
Weight	38 lbs. (17.24 kg)
Operating Temperature	40°F to 104°F / 4°C to 40°C
Flow	
Sample Tubing	150 ft. (45m) Max – ¼” OD x 1/8” ID Teflon FEP Tubing Diisocyanates– 6” Maximum FEP ¼” OD
Exhaust Tubing	25 ft. (7.62m) Max – ¼” OD x 3/16” ID Polypropylene
Pumps	50% duty cycle – long life (2)
Electrical	
Power	Less than 1Amp Max @ 120v AC (60 Hz)
Output Relays	24 VDC 6 Amp Max – 240VAC 6 Amp Max
Analog Output	4-20ma (500-ohm Max Independence)
External Reset	Contact closure (Normally Open)
Maximum Branch-Circuit Rating	20 Amperes
Misc	
Removable Media	Micro SD up to 2 GB formatted (**FAT16 File System)**
Noise Level	< 15 dB

Appendix D – System Event Messages

Color Legend

Alarm	**Gas Alarm**
Fault	**Critical Fault**
Fault	**Minor Fault**
Event	**Information Message**
Event	**Status Update**

Code	Message	Possible Cause	Corrective Action
1	No Gas Data Loaded	System Restored	Contact DOD Technologies Support @ (815) 788-5200
2	DAC Calibration Required	Optics Dirty	See manual appendix H for cleaning instructions. Add filter to inlet if possible. Also, re-adjust optics – make sure fresh tape is inserted and gate is closed. Go to service menu-Optic Calib and press start.
3	Optic Adjustment Fault	Tape not installed or Optic Block issue	Verify a ChemLogic tape is inserted and aligned properly. In addition, verify nothing is covering the holes on the optic block where it meets the paper.
4	No Gas Selected	No Gas Selected	Select gas in setup menu-select gas option
5	Gate Open Fault	Motor did not leave home	Make sure that all wires coming from the HMI to the motor are fully inserted(Red (grey)=Q12 and black=0V). Verify belts are all connected and cam is greased. If these steps do not work, contact DOD Technologies Support @ (815) 788-5200
6	Gate Close Fault	Motor did not return home	Check issue from "Gate and Tape" screen. If the gate opens and does not stop, there is a problem with micro switch. Make sure both wires are connected (I8 and V+). Slightly bend the switch arm toward the motor collar to ensure the set screw is closing the switch. If these steps don't work, contact DOD Technologies Support @ (815) 788-5200
7	High Background Fault	No Tape Loaded	Go to "Gate & Cassette" and load fresh tape.
		Optics Dirty	See manual appendix H for cleaning instructions and add a filter to inlet if possible. Also, re-adjust optics – make sure fresh tape is inserted and gate is closed. Then go to service menu-optics and press start.
8	Optic Comm Failure	Electrical problem	Remove optic block cover and make sure all wires going to the optics are fully inserted. Contact DOD Technologies Support @ (815) 788-5200 if these steps do not correct the problem.
9	All Pumps Disabled	Flow Blocked and/or Unstable Inlet/Exhaust	When blockage is fixed, go to Setup Menu and enable pumps. If problem persists, contact DOD (815) 788-5200.

10	Flow Fluctuation Fault	Flow Blocked and/or Unstable Inlet/Exhaust	When blockage is fixed, go to Setup Menu and enable pumps. If problem persists, contact DOD (815) 788-5200.
11	Idle Timeout	Out of Analysis Beyond Timer	Re-enter Analysis
12	Low Background Fault	Wrong tape or optic problem	Re-adjust optics – make sure fresh tape is inserted and gate is closed. Then go to service menu-Optic Calib and press start. If these steps do not work, contact DOD Technologies Support @ (815)788-5200
13	Purge Option Fault	Tubing Blocked	Find block in sample line
15	Low Supply Voltage	Power Supply failure or calibration setting.	Measure the voltage at the terminal blocks from Red(+) to Black(-) which should be a minimum of 5.3V DC.
			See “Service Menu” section 5.6 for instructions on calibration setting.
16	All Pumps Low	Pump failure(s) or leak	If none of the pumps are able to achieve proper flow setting check using the ‘Flow” screen. See “Service Menu” section 5.6 for instructions on using the “Flow” screen.
33	SD Card Fault	No SD Card or Card Full	If a SD card is installed remove and re-insert
34	Operator Start Analysis	Operator initiated	N/A
35	Chemlogic Tape Low	ChemLogic tape nearing end	Replace tape
36	Pump 1 Disabled	Flow Blocked and/or Unstable Inlet/Exhaust	Go to Setup Menu and enable pump. If problem persists, contact DOD (815) 788-5200.
37	Pump 2 Disabled	Flow Blocked and/or Unstable Inlet/Exhaust	Go to Setup Menu and enable pump. If problem persists, contact DOD (815) 788-5200.
39	High Flow Fault	Optics Orifice Dirty	See manual appendix H for cleaning instructions and add a filter to inlet if possible. If problem persists, contact DOD (815) 788-5200.
40	Alarm Level 1	Gas Detected	After gas leak is found and corrected, reset alarms
41	Alarm Level 2	Gas Detected	After gas leak is found and corrected, reset alarms
42	Remote Reset	Monitor Reset input was triggered	N/A
43	Power On	Monitor was powered on	N/A
44	Optic Calibration	Operator initiated	N/A
45	Pump 1 high voltage	Pump drawing high current or Bad Pump	Leak somewhere between the optics and pumps. Check that pumps are connected and all fittings between the optics and the pumps are fully inserted. If problem persists, contact DOD (815) 788-5200.
46	Pump 2 high voltage	Pump drawing high current or Bad Pump	Leak somewhere between the optics and pumps. Check that pumps are connected and all fittings between the optics and the pumps are fully inserted. If problem persists, contact DOD (815) 788-5200.

47	Warning : Optics Dirty	Dirty Optics	See manual appendix H for cleaning instructions and add a filter to inlet if possible. If problem persists, contact DOD (815) 788-5200.
48	Tape Saver Mode ON	Operator initiated	N/A
49	Hour Diagnostic OK	Hourly Checkup	N/A
50	Flow Failure 1 L	Optics Orifice Dirty	See manual appendix H for cleaning instructions and add a filter to inlet if possible. If problem persists, contact DOD (815) 788-5200.
51	Flow Failure 2 L	Optics Orifice Dirty	See manual appendix H for cleaning instructions and add a filter to inlet if possible. If problem persists, contact DOD (815) 788-5200.
52	Flow Disruption	Flow Inconsistent	Contact DOD Technologies Support @ (815)-788-5200
53	Alarm Level 1 Pt 2	Gas Detected	After gas leak is found and corrected reset alarms
54	Alarm Level 2 Pt 2	Gas Detected	After gas leak is found and corrected reset alarms
55	Flow Failure 1 H	Sample Inlet Blocked or Internal Leak	Leak somewhere between the optics and pumps. Check that pumps are connected and all fittings between optics and pumps are fully inserted. Also, make sure all three wires are connected to the transducer. If problem persists, contact DOD (815) 788-5200.
56	Flow Failure 2 H	Sample Inlet Blocked or Internal Leak	Leak somewhere between the optics and pumps. Check that pumps are connected and all fittings between optics and pumps are fully inserted. Also, make sure all three wires are connected to the transducer. If problem persists, contact DOD (815) 788-5200.
57	Flow Target Adjusted	The target flow was set on the Service Menu ->Flow screen	N/A
58	Dirty Orifice 1	Orifice clogged (CL1)	Refer to cleaning procedure
59	Dirty Orifice 2	Orifice clogged (second point on CL2 option)	Refer to cleaning procedure
60	Operator End Analysis	The operator pressed <F1> to end analysis	N/A

The following list of event codes, which may appear in the event/alarm log, are for use by service personnel.

Code	Diagnostic	Cause
1001	Temperature change event	Optic block temperature delta limit exceeded
1002	Reference Validation event	Possible optical issue
1003	S2 Message Sent	
1004	Analysis Window Timeout	Normal window time reached
1007	Stain filtered	Possibly below LDL
1008	Gas Calibration Time exceeded	New window needed for current concentration level
1009	Decreasing Concentration	New window needed for lower concentration validation
1010	Gas Calibration saturation	New window needed for current concentration level
1020	Flow did not reach steady state	Flow value not steady after a maximum time period
1025	Stain Saturation	New window needed for current concentration level
1028	Auto DAC Adjust Completed	
1033	Tape Advance for Background Verification	
1037	Cumulative stain tape advance	New window needed due to tape staining below LDL
1071	Pump1 Flow Disruption	Large delta in flow value detected
1072	Pump2 Flow Disruption	Large delta in flow value detected
2001	Temperature change event (CL2 option - Point 2)	Optic block temperature delta limit exceeded
2002	Reference Validation tape advance (CL2 option - Point 2)	Possible optical issue
2007	Stain filtered (CL2 option - Point 2)	Possibly below LDL
2008	Gas Calibration Time exceeded (CL2 option - Point 2)	New window needed for current concentration level
2009	Decreasing Concentration (CL2 option - Point 2)	New window needed for lower concentration validation
2010	Gas Calibration saturation (CL2 option - Point 2)	New window needed for current concentration level
2025	Stain Saturation tape advance (CL2 option - Point 2)	New window needed for current concentration level
2038	Cumulative stain tape advance (CL2 option - Point 2)	New window needed due to tape staining below LDL

Appendix E – Gas Specifications

Click the following link to review a list of detectable gases and available system calibrations:

ChemLogic CL1 & CL2 Detectable Gas List

This list can also be accessed and downloaded at DODtec.com by visiting the 'Detectable Gases' section in the corresponding product page(s). Please contact us to inquire into additional target gases or ranges not found on the list.

Appendix F – Removable Media

To ensure that historical and performance information is always stored properly be sure to insert a Micro - Secure Digital (SD) card in the proper slot. See Section 6.6 for installation instructions.

The SD card stores all information in standard comma separated values (*.CSV) format for easy access with any computer. Remove the SD card from the CL1/CL2 as described in section 6.6 and transfer the files to your personal computer*. The files are best viewed with programs that convert CSV format to rows and columns (Microsoft Excel, OpenOffice, etc) but can be viewed with any text editor.

Figure F.1 shows the folders found on the SD card depending on the configuration or your CL1/CL2 and the use of the SD cards. All files have the format YYMMDD.CSV. A new file is automatically created each day – be sure that the Date/Time are set correctly (Section 5.5.e)

Figure F.1

F.1 Concentration Log Files

(YYMMDD*.CSV)
Whenever the concentration detected exceeds the preset alarm level in the CL1/CL2, the system starts a log file on the SD card (if available). The log file will update approximately every 2 seconds until the gas is no longer detected. A sample alarm file is shown below. The columns show: Date, Time, Gas Concentration, Alarm Level 1, Alarm Level 2, and the selected gas range.

Date	Time	rPtGasConc	rPtAlarmLevel1Cu	rPtAlarmLevel2Cu	nPt1GasIdxCur
09/17/07	04:14:20 PM	107.68	100	200	2
09/17/07	04:14:22 PM	114.41	100	200	2
09/17/07	04:14:24 PM	114.41	100	200	2
09/17/07	04:14:26 PM	119.19	100	200	2

F.2 Event Log Files

(YYMMDD*.CSV)
Each time a new event, fault or alarm is added to the History log on the CL1/CL2, the message is written to the current days event log file on the Micro SD card (if available). A sample event log is shown below. The columns show: Date, Time, Event Number, and Action (unused). The Event Numbers are listed in Appendix D.

Date	Time	nEventNumberCF	nEventActionCF
09/17/07	11:07:52 AM	43	1
09/17/07	11:07:52 AM	33	1
09/17/07	11:08:18 AM	48	1
09/17/07	11:08:24 AM	34	1

F.3 Formatting Micro SD Disks

The Micro SD Cards used in the CL1/CL2 must be formatted with the original FAT (FAT16) file system. Most new disks purchased are pre-formatted with FAT32 which will not work in the CL1/CL2. The disks may be formatted either from a PC or in the CL1/CL2.

It is highly recommended that the disk be formatted in the CL1/CL2 using the procedure outlined in the following section instead of using a Windows-based PC.

WARNING – Formatting the Micro SD card will erase all information stored on the card.

WARNING – Make sure to have the correct drive letter for the SD Disk drive. Selecting the incorrect drive and formatting could result in a complete loss of data and/or operation of the computer.

1. Formatting the disk in a MS Windows-based PC
2. Insert the Micro SD card into the SD Card adapter included.
3. Insert the SD card adapter into the correct drive slot on the computer.
4. Open “My Computer”
5. See WARNING above - Right click on the drive letter corresponding to the drive containing the SD Card adapter. Select ‘Format’ from the drop-down menu.
6. Under the heading ‘File System’ select FAT – DO NOT SELECT FAT32
7. Uncheck the “Quick Format” box if it is selected
8. Press Start to format the disk.

When complete the disk is ready for use in the CL1/CL2.

WARNING – Make sure to have the correct drive letter for the SD Disk drive. Selecting the incorrect drive and formatting could result in a complete loss of data and/or operation of the computer.

Formatting the disk in the CL1/CL2

Figure 2.1

Insert the Micro SD card into the slot.

Wait 5 seconds for the drive to initialize.

Hold in both the “UP” arrow and ‘DOWN’ arrow at the same time which should bring up the screen in Figure 2.2.

Figure 2.2

Use the down arrow key to scroll down until you see the menu item “Removable Media” as shown in Figure 2.3

Figure 2.3

Press the <ENTER> key to select “Removable Media” - this will display the contents of the Micro SD card (the screen may look slightly different as shown in Figure 2.4)

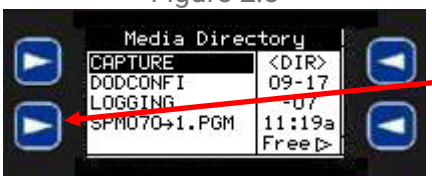


Figure 2.4

Press the softkey on the lower right side which will bring up the screen shown in Figure 2.5

Figure 2.5

Press <F3> to format the disk which will bring up the screen shown in Figure 2.6.

Figure 2.6

Press the <ENTER> key to begin the format.

A Clock face pops up and minute hand rotates till complete (several minutes).

When complete press <ESC> several times to return the CL1/CL2 Main Menu.

F.3 SD Card Status Menu Item

Whenever the concentration detected exceeds the preset alarm level in the CL1/CL2, the system starts a log file on the SD card (if available).

The log file will update approximately every 2 seconds until the gas is no longer detected. A sample alarm file is shown below.
The columns show: Date, Time, Gas Concentration, Alarm Level 1, Alarm Level 2, and the selected gas range.

Date	Time	rPtGasConc	rPtAlarmLevel1Cu	rPtAlarmLevel2Cu	nPt1GasIdxCur
09/17/07	04:14:20 PM	107.68	100	200	2
09/17/07	04:14:22 PM	114.41	100	200	2
09/17/07	04:14:24 PM	114.41	100	200	2
09/17/07	04:14:26 PM	119.19	100	200	2

Appendix G – ChemLogic® Cassettes

ChemLogic Cassettes are designed for use in colorimetric-based gas monitoring systems.

Since this is a particular end-use function and does not release or result in exposure to hazardous chemicals under normal use Material Safety Data Sheets (MSDS) are not required.

ChemLogic Cassettes are non-toxic and require no special precautions for protection. However, contact with skin may cause the cassette to react, change color, and no longer be useful in your gas monitoring system.

We therefore always recommend that rubber gloves be worn while handling including removal and installation.

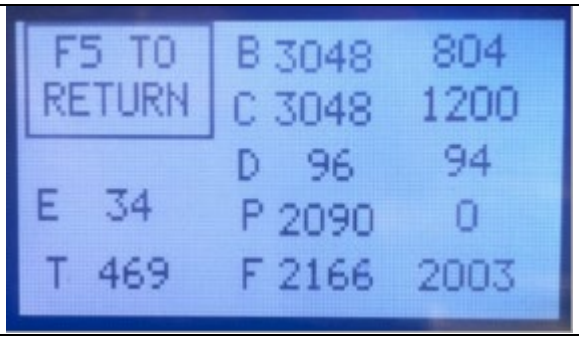
Always wash hands as a precaution after handling ChemLogic Cassettes.

Appendix H – Advanced Optics Cleaning Procedure

NOTE: Only perform this procedure when CL1 & CL2 display reads “DIRTY” or DAC value exceeds 150.

1. Enter the CL1 Main Menu	
2. Enter the Service Menu (Password: 1234)	
3. Enter “Optic Calib.”	
4. Press “Open/Close”	
5. Remove the ChemLogic® cassette from the gate	
6. After the gate is open, remove the (2) Phillips screws that hold the back-plane block cover.	
7. Remove the (2) Phillips screws holding the back-plane block. The face of the optic block should be exposed once completed.	
8. You should see (4) circular holes with a green light flashing in one channel at a time. Each one of these holes represents a channel. The CL1 only uses channel 2 for gas detection	

9. To clean the fiber optic lenses, you will need a Small cotton swab(Q-tip) and Industrial alcohol.	
10. Dip the cotton swab into the alcohol and insert it in channel 2. It is very important to clean both lenses. Make sure to put the swab straight in to clean the first lens and angled downward to clean the second lens.	 
11. After the cleaning is complete re-insert the cassette and put the back-plane block on. Press "Open/Close" and the gate will close.	
12. Press start to initiate the calibration process. The current DAC value will become 0. Then the new DAC value will populate. This new value should between 60-130 which is the manufacturers range. DAC value cannot be improved from the value it is shipped at. Call DOD Technologies to check your starting DAC value.	
13. When done, the main menu should be on the display and press start analysis.	
14. Once in analysis press F6 in order to see the technician screen.	

15. In the technician screen you will see the letter D. In front of the D is a number that represents how bright your optic LED is. When this number reaches 140 you will be prompted to clean with a fault. When this value reaches 150 your CL1 will not go in to analysis until the optic block is cleaned.	
16. Repeat the cleaning process until this value is back to the manufacturer's DAC value range below 130.	
17. Once the value is below 130 re-install the optic block covers.	

H.1 Optic Orifice Cleaning

This procedure describes the cleaning of the CL1 / Cl2 optic orifice to prevent the buildup of debris around the orifice that could cause increased pressure readings and decreased pump voltages.

1. Press F1 to exit analysis
2. Make sure the gate is closed
3. POWER OFF the CL1 / CL2 unit
4. Carefully remove the optic exhaust tube without pulling the optic wires loose
5. Spray compressed air into the optic exhaust channel down towards the inlet of the CL1 (You should feel air coming out of the inlet)
6. Reinstall the optic exhaust tube
7. POWER ON the CL1 / CL2 unit

Figure H.1.1

Appendix I – Additional Options

WARNING – These options should be changed only under direction from trained DOD service personnel. **Contact DOD for more information**.

I.1 Pressure Check Disable Mode

(Default: OFF)
Useful for extreme conditions where the pressure at the sample point varies often. When enabled this option will change the operation of the flow system in the CL1/CL2 as follows:

- Positive pressure into the system is ignored.
- Slight negative pressure will not cause flow fluctuation warnings.
- Flow fluctuation at the inlet is allowed if the negative pressure does not exceed the capability of the pump to draw a valid sample pressure.
- 'PRES' is displayed on the screen during analysis when enabled. Note - 'PRES' displays only when an SD card is inserted, the optics are clean, and the concentration is below full scale.

The flow into the system should be manually verified periodically when this mode is enabled

WARNING – Use caution when **Pressure check disable mode** is enabled as positive pressure may introduce toxic gas into the system when the gate opens. In addition, **displayed gas concentrations may not be accurate** when the flow level is not within normal limits of the CL1/CL2.

I.2 Optics Auto Calibration

(Default: ON)
When enabled the CL1/CL2 automatically adjusts the optics as needed during each cassette advance and displays a warning when the optics are dirty.

Disabling this option may cause HIGH BACKGROUND errors and require manual adjustment of the optics.

I.3 Maintenance Relay

(Option 2-600-211)
When option 2-600-211 is included the CL1/CL2 contains an extra relay which will trigger during three maintenance fault conditions:

1. Cassette Days Low Fault – Less than 3 days of ChemLogic Cassette remaining.
2. Optic Dirty Fault – The optics system needs to be cleaned.
3. SD Card Fault – The system cannot write to the SD storage card.

With this option there are 3 extra terminal blocks included inside the CL1/CL2 which are labeled “Q”,”R”, and “S” as shown in Figure I.3.1 below.

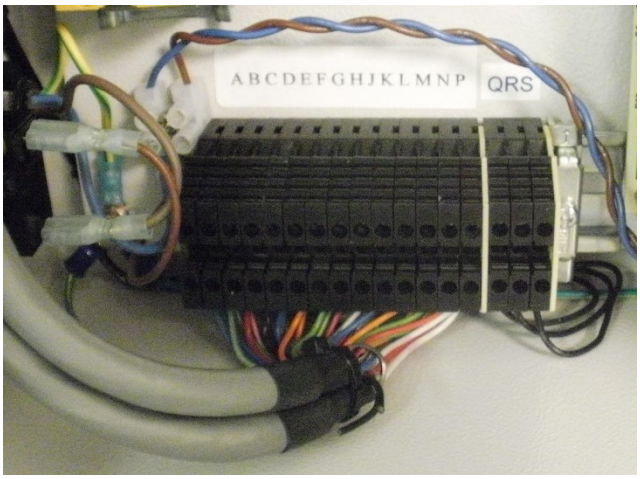


Figure I.3.1

Terminal Q – Normally closed
Terminal R – Common
Terminal S – Normally open

** Also note that the relay is affected by the Energized/De-Energized setting in the CL1/CL2.
The maintenance relay has the same specifications as any of the relays available on the standard 14 pin connector:
24 VDC 6 Amp Max – 240VAC 6 Amp Max

I.4 Z-Purge Enclosures with Vortex (A/C) Coolers

For your reference we have included the booklet for the Model YZ101 Purge Unit and the Operation & Safety instructions for the Vortex cooler.

For more in-depth information you may reference NFPA 496 – Standard for Purged and Pressurized Enclosures for Electrical Equipment.

Please follow the steps below to CONNECT THE PURGE SUPPLY TO THE CL1/CL2-purge enclosures.

WARNING: The Purge air (Instrument quality air or Inert Gas) intake MUST originate in a NON-HAZARDOUS area.

	Please review (for reference) the “Protected Enclosure Criteria” and the “Enclosure Connection Requirements” on pages 3 & 4 of the Model YZ101 Operating Manual.
	Refer to Model YZ101 Installation & Operating Manual for Unit Tubing Instructions, requirements, and restrictions.
	NOTE: The tubing size connection to the Unit Supply Connection has been changed to 3/8”.
	Refer to Operation & Safety Instructions for the Vortex Cooler for Compressed Air Supply, Maintenance, Installation requirements, and general information. Vortex air inlet (3/8”) fitting.

For your reference we have included the booklet for the Model YZ101 Purge Unit. For more in-depth information you may reference NFPA 496 – Standard for Purged and Pressurized Enclosures for Electrical Equipment.

Please follow the steps below to set up and operate the CL1/CL2 z-purge enclosures.

BEFORE applying power to enclosure, Class I installations require four (4) volume exchanges through the protected enclosure while maintaining a positive pressure. Follow this procedure each time before power is switched on. If you have any questions contact DOD Technologies, INC before proceeding.

NOTE: The Purge supply should be of "Instrument Quality" air, free from any oils, dirt, and liquid(s). Inert gas can substitute for "Instrument Quality" air as a Purge supply.
CAUTION: This procedure should only be used after the unit is properly installed and the supply of Purge air (or inert gas) is connected properly to both the Vortex Cooler and the Purge Unit.

1. With Enclosure power off, remove any dust from enclosure (Class II applications).
2. Confirm protected enclosure door(s) is sealed and Purge air supply is on.
3. Activate alarm system (if utilized), then adjust the Enclosure Pressure Control Regulator unit until the Enclosure Pressure Gauge reads a minimum of 0.5" on the scale.

IF UNABLE TO REACH 0.5" ON GAUGE VERIFY THAT THE AIR SUPPLY IS ACTIVE, AND THE DOOR IS LATCHED PROPERLY, THEN CHECK THE UNIT FOR LEAKS.

DO NOT PROCEED UNLESS A MINIMUM OF 0.5" IS READ ON THE SCALE WHILE THE VORTEX COOLER IS **NOT** ACTIVE.

4. Next, turn the Enclosure Pressure Control Regulator 1 FULL turn clockwise and allow Purge air to run for 2 Minutes (Minimum Purge Time) before continuing (Class I applications).

CAUTION: Make sure the pressure remains in the SAFE range the entire time the unit is purging. It is acceptable if Vortex cooler activates while unit is purging as long as needle remains above 0.5" in the SAFE area on pressure gauge.

5. Once the required minimum time has elapsed **AND** the Enclosure Pressure reading is still in the SAFE zone you may safely power on the unit.

WARNING: IMMEDIATELY remove power upon loss of SAFE pressure.

I.5 New Light Option

(Default: OFF)
Customers with the side panel-mounted light option revision B or higher require CL1/CL2 software version 15.11 or higher and must enable this option in the Configuration menu for proper light operation. All previous units without a revision label on the light option side panel or those with Revision A must have this option disabled.

To enable/disable this option:

- From the main menu go to the Service Menu and enter the appropriate password
- From the Service Menu select Configuration and enter the appropriate key value – Contact DOD service for assistance if needed.
- On the Configuration menu scroll down and select Options
- On the Options menu scroll and select "New Light Option"
- Change the value from 0 to 1 to enable the new light option.

Appendix J – Installation, Wiring and Flow Diagrams

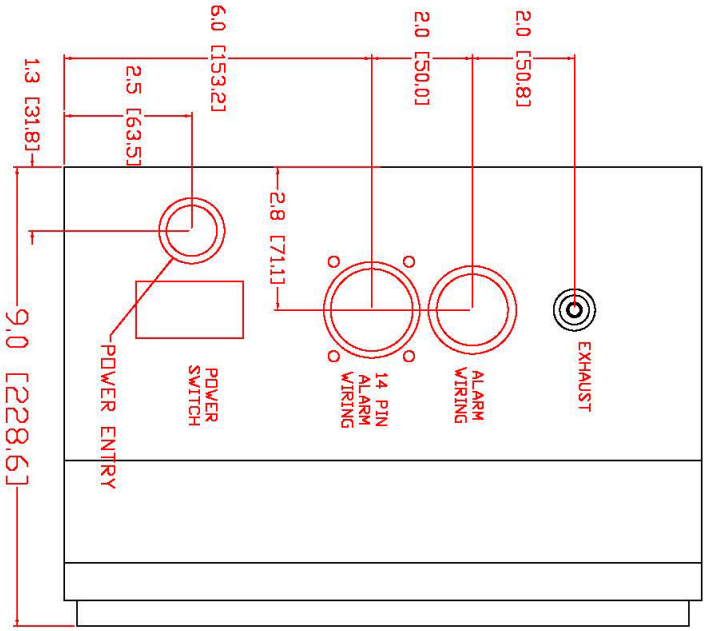
CL1 INSTALLATION DIAGRAM

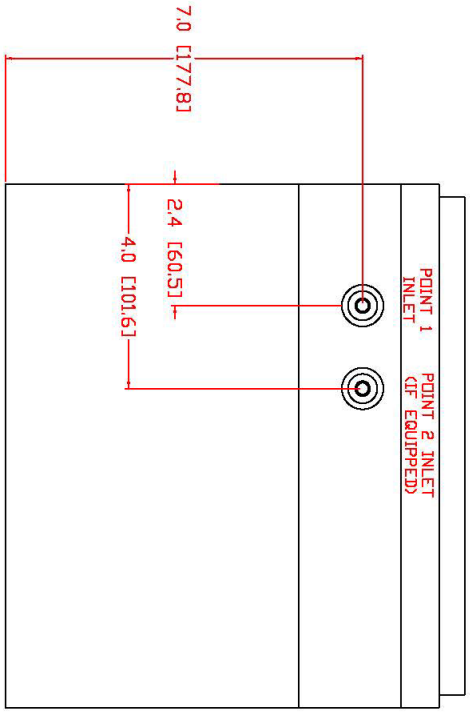
OPERATING VOLTAGE
100-260 VAC 50/60 HZ <1.0 AMPS

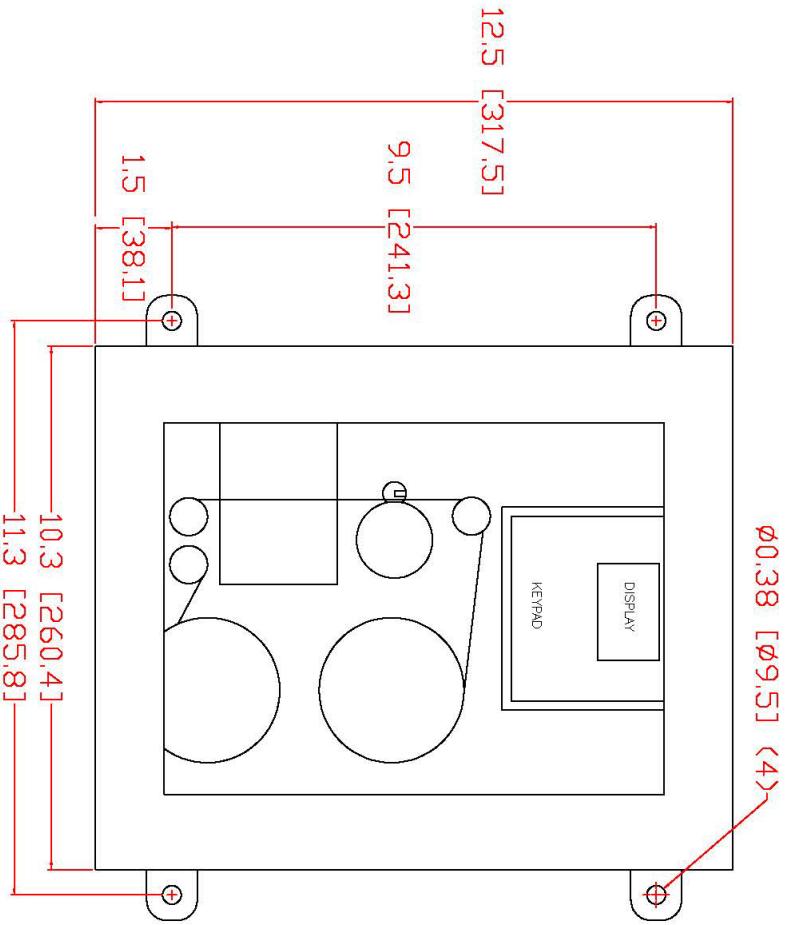
PLEASE ALLOW 4" MINIMUM SPACING ON LEFT SIDE TO ALLOW DOOR SWING.

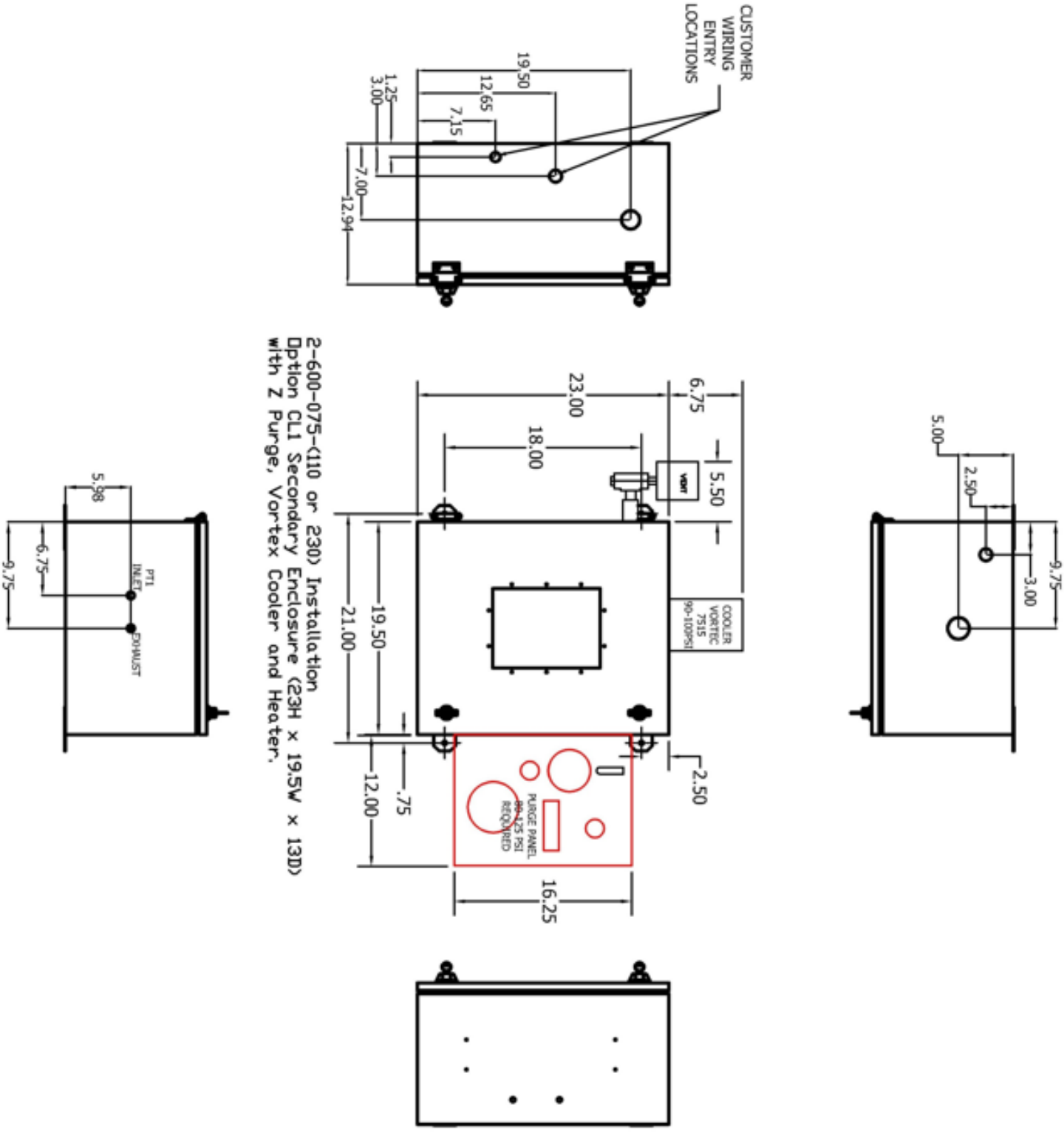
SAMPLE TUBING POINTS (FEP TEFLON)
¼" OD X ⅛" ID X 150' (45 MTRS)
6" MAX FOR DISOCYANATE APPLICATIONS

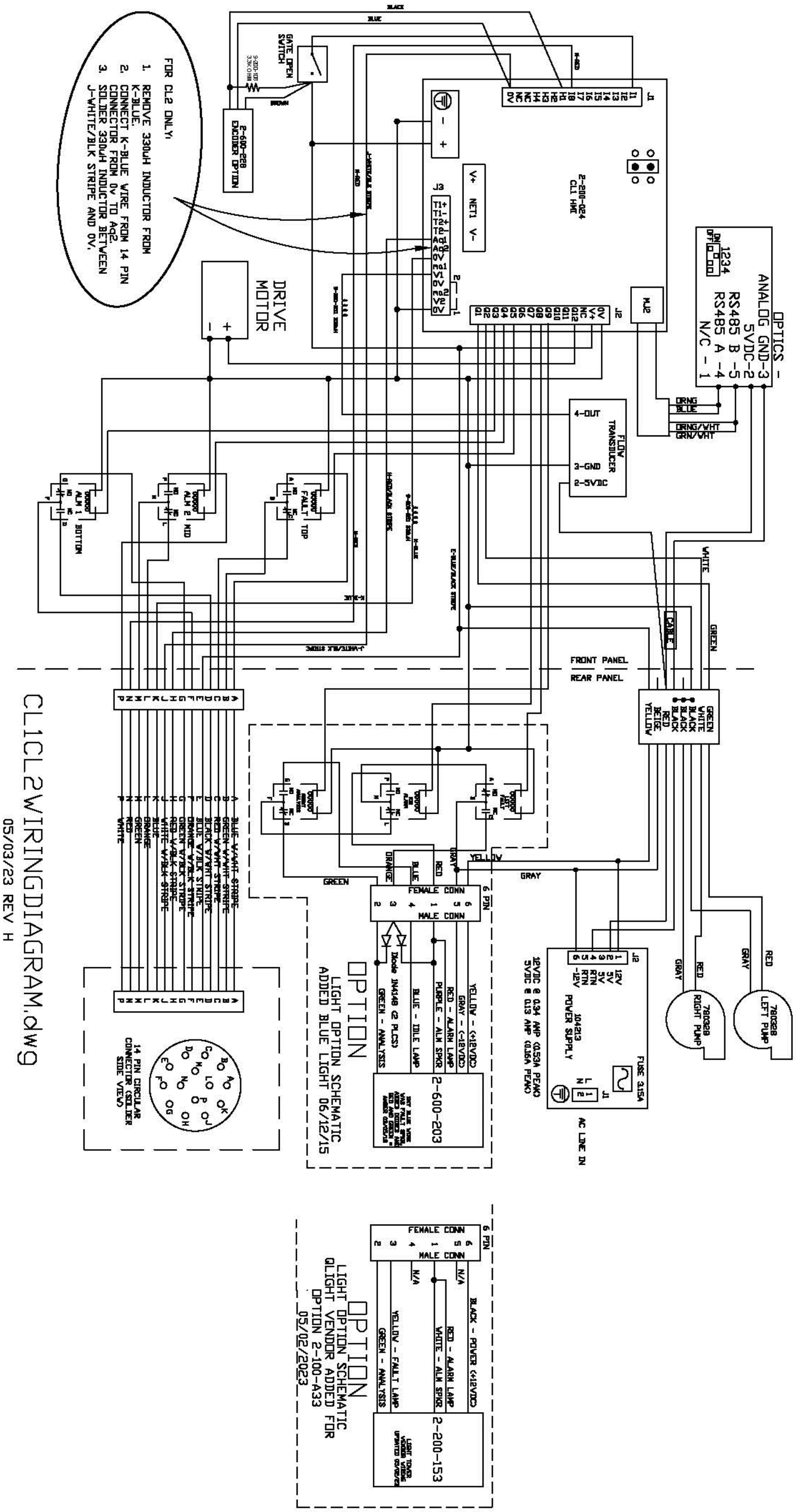
EXHAUST TUBING
1/4" OD X 3/16" ID X 25' (7.5 MTRS)

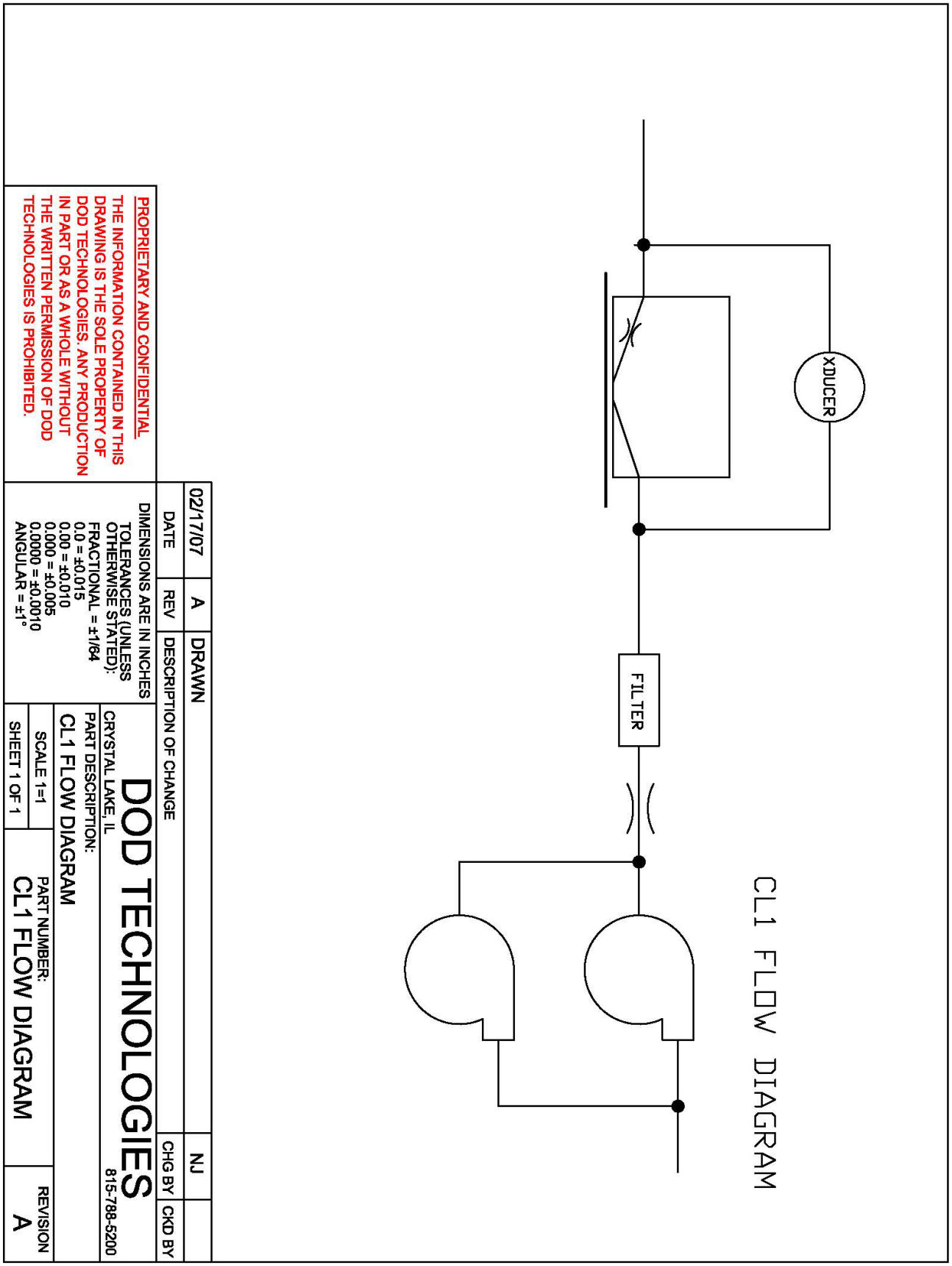







CUSTOMER WIRING ENTRY LOCATIONS
19.50
12.65
7.15
1.25
3.00
7.00
12.94
2-600-075-(110 or 230) Installation
Option CL1 Secondary Enclosure (23H x 19.5W x 13D)
with Z Purge, Vortex Cooler and Heater.
23.00
18.00
6.75
5.50
VENT
21.00
19.50
12.00
.75
2.50
16.25
COOLER VORTEC 7515 90-100PSI
PURGE PANEL 80-125 PSI REQUIRED
5.00
2.50
3.00
9.75
5.98
6.75
9.75
PT1 INLET
EXHAUST


CL1CL2WIRINGDIAGRAM.dwg
05/03/23 REV H
FOR CL2 ONLY:
1. REMOVE 330uH INDUCTOR FROM K-BLUE.
2. CONNECT K-BLUE WIRE FROM 14 PIN CONNECTOR FROM 0V TO AQ2.
3. SOLDER 330uH INDUCTOR BETWEEN J-WHITE/BLK STRIPE AND 0V.
DRIVE MOTOR
OPTICS -
ANALOG GND-3
5VDC-2
RS485 B -5
RS485 A -4
N/C - 1
FRONT PANEL
REAR PANEL
OPTION
LIGHT OPTION SCHEMATIC
ADDED BLUE LIGHT 06/12/15
2-600-203
OPTION
LIGHT OPTION SCHEMATIC
QLIGHT VENDOR ADDED FOR
OPTION 2-100-A33
05/02/2023
2-200-153


CL1 FLOW DIAGRAM
XDUCER
FILTER
PROPRIETARY AND CONFIDENTIAL
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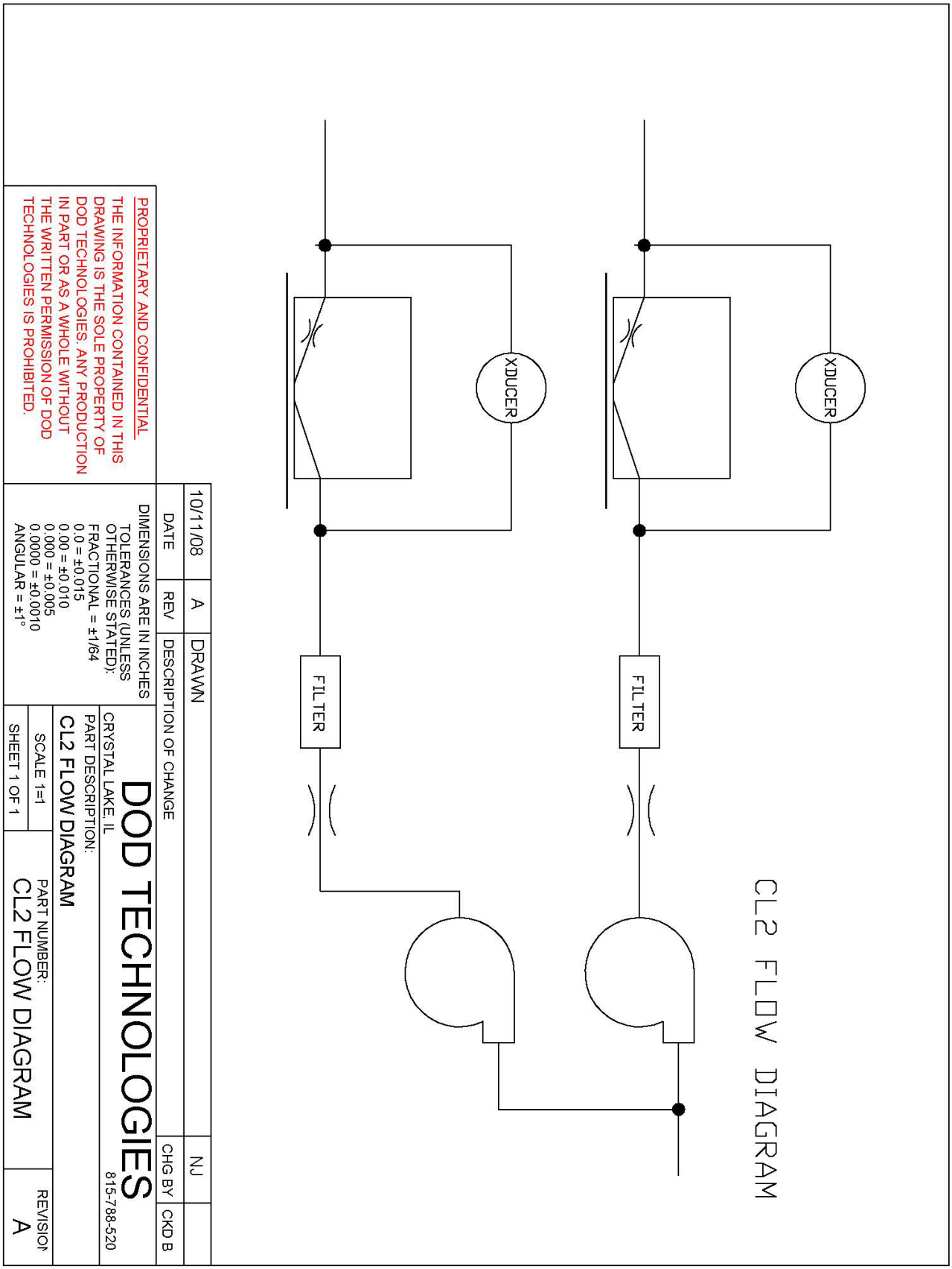
DIMENSIONS ARE IN INCHES
TOLERANCES (UNLESS OTHERWISE STATED):
FRACTIONAL = ±1/64
0.0 = ±0.015
0.00 = ±0.010
0.000 = ±0.005
0.0000 = ±0.0010
ANGULAR = ±1°
DOD TECHNOLOGIES
CRYSTAL LAKE, IL
815-788-5200
PART DESCRIPTION:
CL1 FLOW DIAGRAM
SCALE 1=1
SHEET 1 OF 1
PART NUMBER:
CL1 FLOW DIAGRAM
REVISION
A
DATE
REV
DESCRIPTION OF CHANGE
CHG BY
CKD BY
02/17/07
A
DRAWN
NJ


CL2 FLOW DIAGRAM
XDUCER
XDUCER
FILTER
FILTER
PROPRIETARY AND CONFIDENTIAL
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DIMENSIONS ARE IN INCHES
TOLERANCES (UNLESS OTHERWISE STATED):
FRACTIONAL = ±1/64
0.0 = ±0.015
0.00 = ±0.010
0.000 = ±0.005
0.0000 = ±0.0010
ANGULAR = ±1°
DOD TECHNOLOGIES
CRYSTAL LAKE, IL
815-788-520
PART DESCRIPTION:
CL2 FLOW DIAGRAM
SCALE 1=1
SHEET 1 OF 1
PART NUMBER:
CL2 FLOW DIAGRAM
REVISION
A
DATE
REV
DESCRIPTION OF CHANGE
CHG BY
CKD B
10/11/08
A
DRAWN
NJ

Appendix K – Data Communications

K.1 Modbus/TCP

*** Read with Modbus Code 3 (Read Holding Register)**

4x Modbus*	RSLogix Notation	Size (Bits)	Type	Description
3122	N41: 21	16	WORD	Tape Days Remaining
3177	N41: 76	16	WORD	Gas Number
3262	N42: 61	32	FLOAT	Full Scale 1
3264	N42: 63	32	FLOAT	Full Scale 2
3500	N44: 99	16	WORD	Software Version
3501	N45: 0	16	WORD	Software Build
3514	N45: 13	16	WORD	Gas Index 1
3515	N45: 14	16	WORD	Gas Index 2
3516	N45: 15	32	FLOAT	K Factor 1
3518	N45: 17	32	FLOAT	K Factor 2
3520	N45: 19	16	WORD	DAC Value 1
3521	N45: 20	16	WORD	DAC Value 2
3522	N45: 21	16	WORD	Cal Reference 1
3523	N45: 22	16	WORD	Cal Reference 2
3526	N45: 25	32	FLOAT	Alarm Level 1 - Pt 1
3528	N45: 27	32	FLOAT	Alarm Level 1 - Pt 2
3530	N45: 29	32	FLOAT	Alarm Level 2 - Pt 1
3532	N45: 31	32	FLOAT	Alarm Level 2 - Pt 2
3558	N45: 57	16	WORD	DAC Warn Limit
3559	N45: 58	16	WORD	DAC Min Warn Limit
3596	N45: 95	16	WORD	Days Per Tape
3632	N46: 31	32	FLOAT	LDL 1
3634	N46: 33	32	FLOAT	LDL 2
3640	N46: 39	16	WORD	Heartbeat
3641	N46: 40	16	WORD	Heartbeat Bit0 Toggle
3644	N46: 43	16	WORD	Background 1
3646	N46: 45	16	WORD	Background 2
3648	N46: 47	16	WORD	Optic Value 1
3649	N46: 48	16	WORD	Optic Value 2
3658	N46: 57	32	FLOAT	Gas Concentration 1
3660	N46: 59	32	FLOAT	Gas Concentration 2
3688	N46: 87	16	WORD	Optical Value 1
3689	N46: 88	16	WORD	Optical Value 2
3690	N46: 89	16	WORD	Reference 1

4x Modbus*	RSLogix Notation	Size (Bits)	Type	Description
3691	N46: 90	16	WORD	Reference 2
3692	N46: 91	16	WORD	Fault/Event Bits (See Table Below)
3694	N46: 93	16	WORD	Fault/Event Bits (See Table Below)
3695	N46: 94	16	WORD	Fault/Event Bits (See Table Below)
3700	N46: 99	16	WORD	Flow Offset 1
3701	N46: 100	16	WORD	Flow Offset 2

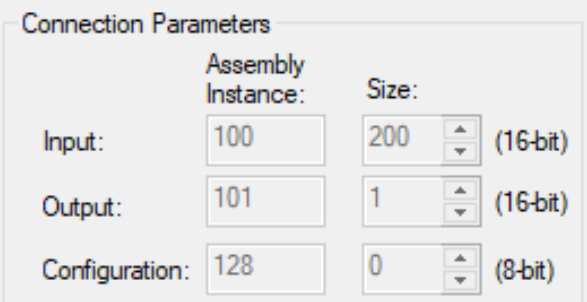
CL1/CL2 Fault/Event Bits

4x Modbus*	RSLogix Notation	Bit #	Fault Description
3692	N46: 91	0	No Gas Tables Loaded
3692	N46: 91	1	Optics Need Calibration
3692	N46: 91	2	Optics Adjustment Failed
3692	N46: 91	3	No Gas Table Selected
3692	N46: 91	4	Gate Close Fault
3692	N46: 91	5	Gate Open Fault
3692	N46: 91	6	High Background (Check Tape)
3692	N46: 91	7	IO Failure
3692	N46: 91	8	All Pumps Disabled
3692	N46: 91	9	Unable to achieve steady flow
3692	N46: 91	10	Idle Timeout
3692	N46: 91	11	Low Background (Recalibrate)
3692	N46: 91	12	Backflush Purge Fault 1
3692	N46: 91	13	Backflush Purge Fault 1
3692	N46: 91	14	Low Voltage – Check Power Supply
3692	N46: 91	15	Unused
3694	N46: 93	0	Invalid or missing Micro SD Card
3694	N46: 93	1	Analysis Active
3694	N46: 93	2	Tape < 3 Days remaining
3694	N46: 93	3	Pump 1 Disabled
3694	N46: 93	4	Pump 2 Disabled
3694	N46: 93	5	Large Flow Fluctuation
3694	N46: 93	6	Pump voltage extremely high
3694	N46: 93	7	Gas Alarm Level 1
3694	N46: 93	8	Gas Alarm Level 2
3694	N46: 93	9	Remote Reset Active
3694	N46: 93	10	Device Powered on (Always 1)
3694	N46: 93	11	Optics were Calibrated
3694	N46: 93	12	High Voltage on Pump 1
3694	N46: 93	13	High Voltage on Pump 2
3694	N46: 93	14	DAC(Optics) High – Clean and calibrate

4x Modbus*	RSLogix Notation	Bit #	Fault Description
3694	N46: 93	15	Cassette Saver Mode Active
3695	N46: 94	0	Unused
3695	N46: 94	1	Pump 1 Failure
3695	N46: 94	2	Pump 2 Failure
3695	N46: 94	3	Flow Disruption
3695	N46: 94	4	Pt 2 Gas Alarm 1 (2 Point Unit)
3695	N46: 94	5	Pt 2 Gas Alarm 2 (2 Point Unit)
3695	N46: 94	6	Unused
3695	N46: 94	7	Unused
3695	N46: 94	8	Unused
3695	N46: 94	9	Pump 1 Low
3695	N46: 94	10	Pump 2 Low

K.2 Ethernet/IP

The CL1/CL2 Factory IP address is 192.168.16.212 and is user-adjustable from the service menu. Data can be read from the CL1/CL2 using the following parameters:



Note: Adjust RPI to 150ms to give the CL1/CL2 time to respond to packets.

Word Offset	Size (Bits)	Type	Description
0	16	WORD	Software Version
1	16	WORD	Software Build
14	16	WORD	Gas Index
16	32	FLOAT	K Factor
20	16	WORD	DAC Value
22	16	WORD	Cal Reference
26	32	FLOAT	Alarm Level 1
30	32	FLOAT	Alarm Level 2
58	16	WORD	DAC Warn Limit
59	16	WORD	DAC Min Warn Limit

Word Offset	Size (Bits)	Type	Description
96	16	WORD	Days Per Tape
100	16	WORD	Tape Days Remaining
101	16	WORD	Gas Number
102	32	FLOAT	Full Scale
132	32	FLOAT	LDL
144	16	WORD	Background 1
146	16	WORD	Background 2
148	16	WORD	Optic Value
158	32	FLOAT	Gas Concentration
188	16	WORD	Optical Value 2
190	16	WORD	Reference
192	16	WORD	Fault/Event Bits (See Table Below)
194	16	WORD	Fault/Event Bits (See Table Below)
195	16	WORD	Fault/Event Bits (See Table Below)
200	16	WORD	Flow Offset

CL1/CL2 Fault/Event Bits

Word Offset	Bit #	Fault Description
192	0	No Gas Tables Loaded
192	1	Optics Need Calibration
192	2	Optics Adjustment Failed
192	3	No Gas Table Selected
192	4	Gate Close Fault
192	5	Gate Open Fault
192	6	High Background (Check Tape)
192	7	IO Failure
192	8	All Pumps Disabled
192	9	Unable to achieve steady flow
192	10	Idle Timeout
192	11	Low Background (Recalibrate)
192	12	Backflush Purge Fault 1
192	13	Backflush Purge Fault 1
192	14	Low Voltage – Check Power Supply
192	15	Unused
194	0	Invalid or missing Micro SD Card
194	1	Analysis Active
194	2	Tape < 3 Days remaining
194	3	Pump 1 Disabled
194	4	Pump 2 Disabled
194	5	Large Flow Fluctuation
194	6	Pump voltage extremely high
194	7	Gas Alarm Level 1

Word Offset	Bit #	Fault Description
194	8	Gas Alarm Level 2
194	9	Remote Reset Active
194	10	Device Powered on (Always 1)
194	11	Optics were Calibrated
194	12	High Voltage on Pump 1
194	13	High Voltage on Pump 2
194	14	DAC(Optics) High – Clean and calibrate
194	15	Cassette Saver Mode Active
195	0	Unused
195	1	Pump 1 Failure
195	2	Pump 2 Failure
195	3	Flow Disruption
195	4	Pt 2 Gas Alarm 1 (2 Point Unit)
195	5	Pt 2 Gas Alarm 2 (2 Point Unit)
195	6	Unused
195	7	Unused
195	8	Unused
195	9	Pump 1 Low
195	10	Pump 2 Low