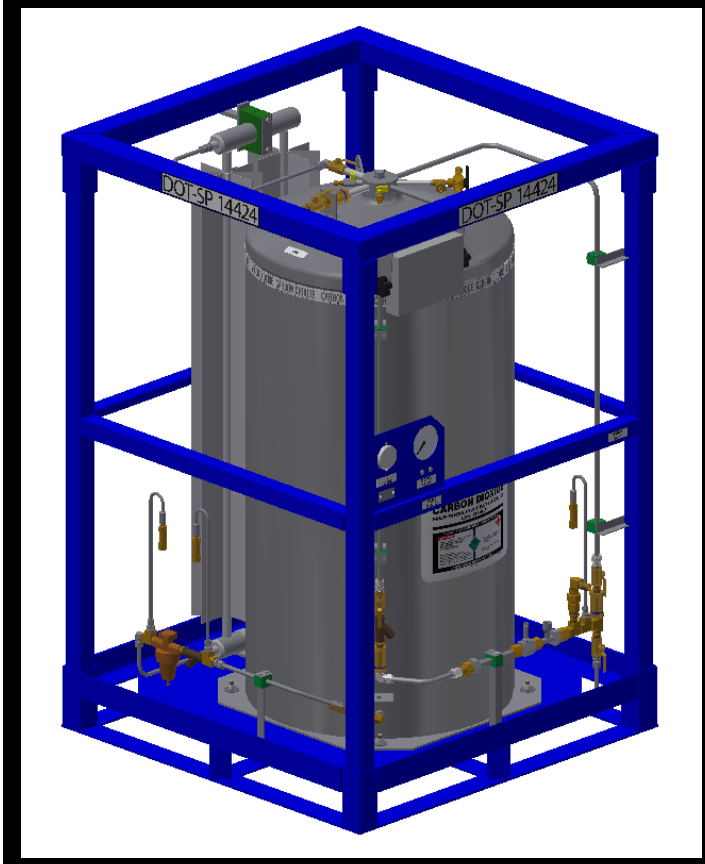
VLCD Operating Manual



MODEL	PART NUMBER
VLCD 950 Single Unit	14228743
VLCD 950 W/ Flow Meter	20546191
VLCD 1900	13779826

P/N 20664292 REV 0

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REVISION LOG		
LETTER	**DATE**	**DESCRIPTION**

SECTION 1 PREFACE

General

The VLCD operating manual is designed to be used in conjunction with all VLCD models provided by Chart. This manual contains information regarding the safe operation and handling of liquid carbon dioxide with the cylinder. It should be thoroughly read and understood by anyone that operates the equipment. If there are any questions regarding the operation of the VLCD, contact Chart Technical Service at:

Chart
407 Seventh St. NW
New Prague, MN 56071
(800) 400-4MVE

This manual is intended to provide the user with all the necessary information needed to install, operate and maintain the VLCD.

The schematic, piping illustrations and parts list shows a reference number for each component used on the cylinders. The reference numbers may refer to the same functional component between the various models. The reference numbers will be used throughout this manual to draw specific attention to a component while describing its function, operation, or repair.

Section 2 discusses the warranty of the VLCD Units.

Section 3 discusses the general features of the tank and the theory of operation.

The safety requirements for operating the cylinder including the handling and transporting cryogenic products are shown in Section 3. Use this safety section as a “Safety Check-List” each time the equipment is being used.

Section 4 and 5 shows the schematics and specifications for the VLCD

Section 6 gives a step by step procedure for the basic operation of the tank.

Section 7 and 8 indicate how to troubleshoot, maintain and repair the cylinder.

Section 9 provides you with an explosive view of each tanks plumbing along with a corresponding parts list.

Terms

Throughout this manual safety precautions will be designated as follows:

WARNING - Description of a condition that can result in personal injury or death.

CAUTION - Description of a condition that can result in equipment or component damage.

NOTE - A statement that contains information that is important enough to emphasize or repeat.

Abbreviations

The following abbreviations and acronyms are used throughout this manual:

CBM	Center Back Mount Gauge
CGA	Compressed Gas Association
FPT	Female Pipe Thread
MPT	Male Pipe Thread
NPT	National Pipe Thread
NR	Not Required
ODT	Outside Diameter Tube Size
PB	Pressure Builder
P/N	Part Number
PPM	Parts per Million
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch (Gauge)
SCF	Standard Cubic Feet
SCM	Standard Cubic Meters
SS	Stainless Steel
NM^3	Normal Cubic Meters

SECTION 2 WARRANTY

Warranty Policy

Chart Inc> ("Chart") warrants to the Purchaser that the MVE Bulk CO_2 Storage Systems equipment (the "Equipment") shall be free from any defects in workmanship and materials; provided, however, that this warranty shall be limited to Equipment found to be defective within a period of one (1) year from initial use or eighteen (18) months from the date of shipment, whichever expires first, except that parts sold as a spare or for replacement are warranted for ninety (90) days from the date of shipment. Chart also warrants the vacuum on the Equipment for five (5) years from the date of the original Chart invoice. Chart warrants that its services will be performed in a professional and workmanlike manner. All Chart services are warranted for a period of ninety (90) days from the date of their completion.

Purchaser agrees that as a pre-condition to a Chart liability hereunder, Purchaser or its appointed agents shall fully inspect all Equipment immediately upon delivery and shall give Chart written notice of any claim or purported defect within ten (10) days after discovery of such defect.

As a further pre-condition to any Chart liability hereunder, an approved Chart service company must supply both part replacement and labor and Purchaser must strictly adhere to the Warranty Claims Procedure set forth below. Chart's sole and exclusive liability under this limited warranty is to the original Purchaser only and is, at Chart's sole option: (1) repair or replacement of the defective Equipment or parts thereof; or (2) refund the net purchase price of the defective Equipment or parts thereof paid by the original Purchaser; or (3) in the case of nonconforming services, provide equivalent services or refund the net price paid by the original Purchaser for such services. Chart shall not be responsible for providing working access to the defect, including disassembly and reassembly of Equipment or for providing transportation to and from Chart's repair or factory facility, all of which shall be at Purchaser's risk an expense.

This limited warranty does not apply to Equipment that Chart determines to have been caused by the effects of normal wear and tear, erosion, corrosion, fire, flood, explosion or other excessive external forces, misuse, abuse, negligence or accident. Alterations or repairs by an party other than those designated and approved in writing by Chart, or installation, storage, maintenance or operation of such Equipment in a manner inconsistent with Chart accepted practices, normal operations instructions, specifications and drawings, or outside the specified design conditions, unless pre-authorized in writing by Chart, shall void this limited warranty. Modifications in any way to the Equipment without Chart's prior written approval shall render this warranty void. This limited warranty does not apply to Equipment comprised of material provided or a design stipulated by Purchaser or to Equipment purchased used. Negligent handling of the vacuum by the Purchaser or others, or testing of the vacuum levels by any party other than a Chart designated and approved party shall render the vacuum warranty void.

Repairs or replacements made pursuant to warranty shall not renew or extend the applicable original warranty period; provided however, that any such repairs or replacement of Equipment or parts thereof shall be warranted for the time remaining in the original warranty period or thirty days, whichever is longer.

Individual parts replacements under warranty and with a component list price less than $50.00 will be replaced at no charge. Individual component costs exceeding $50.00 that are replaced under warranty will be invoiced to the Purchaser and the Purchaser will be issued credit based on results of Chart's evaluation of the returned component(s). The Return Material Authorization (RMA) process must be initiated prior to shipment of any replacement parts.

Chart is not liable for component replacement labor exceeding 2 hours for actual replacement and 2 hours travel time (4 hors @ $65.00/hour maximum).

CHART SPECIFICALLY MAKES NO WARRANTIES OR GUARANTEES, EXPRESSED OR IMPLIED, INCLUDING THE WARANTIES OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, OR WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OR TRADE, WHICH ARE ALL EXPRESSLY DISCLAIMED, OTHER THAN LIMITED WARRANTIES EXPRESSLY SPECIFIED HERIN.

IN NO EVENT SHALL CHART BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTILAL DAMGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS, LOST OPPORTUNITY, LOSS OR USE OF THE EQUIPMENT, CO_2 LOSS, COST OF CAPITAL, COST OF SUBSTITUTE EQUIPMENT, DOWNTIME, COSTS, COSTS OF DELAYS NOR FOR ANY PENALTIES, WHETHER ANY SUCH CLAIM FOR THE SAME IS ON CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE. CHART'S LIABILITY FOR ANY SUCH CLAIMS WHETHER IN CONTRACT, WARRANTY, NEGLIGENCE, TORT, STRICT LIABILITY, OR OTHERWISE OR FOR ANY LOSS OR DAMAGE ARISINGOUT OF, CONNECTED WITH, OR FROM ANY DESIGN, SALE, INSTALLATION, OPERATION OR USE OF THE EQUIPMENT OR PERFORMANCE OF ANY SERVICCES RENDERED BY CHART, SHALL IN NO EVENT EXCEED THE PURCHASE PRICE PAID TO CHART BY PURCHASER FOR THE SPECIFIC EQUIPMENT OR PART THEREOF OR FOR THE SERVICES GIVING RISE TO THE CLAIM. PURCHASER AGREES TO DEFEND, INDEMNIFY AND HOLD CHART HARMLESS FROM ANY THIRD PARTY CLAIMS ARISING OUT OF THE USE, SALE, OR LEASE OF THE EQUIPMENT.

This Warranty Policy is not intended to replace or supersede the warranties, limitation, exclusive remedy and disclaimers set forth in Chart's Terms and Conditions of Sale. In the event f a conflict between Chart's Terms and Conditions of Sale and this Warranty Policy, this Warranty Policy shall control.

Warranty Claims Procedure

All warranty claims must be previously authorized by: Chart, Inc.

Telephone, electronic or written approval may be obtained by contacting Chart's Customer Service Department at:

-Telephone: 800-247-4446
800-253-1769

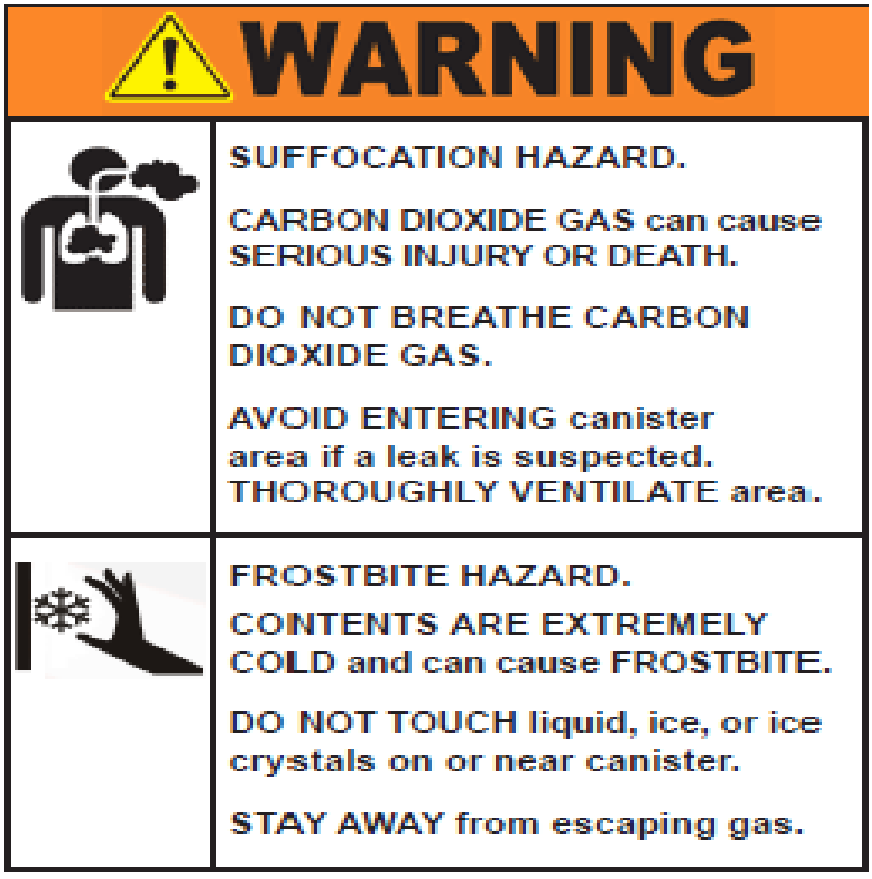
-Facsimile: 952-758-8275
or by writing to:

Chart Inc.
MVE Beverage Systems
Storage Systems Division
407 Seventh Street NW
New Prague, MN 56071-1000
USA

SECTION 3 SAFETY

While Chart equipment is designed and built to the most rigid standards, no piece of, mechanical equipment can ever be made 100% foolproof. Strict compliance with proper safety and handling practices are necessary when using a cryogenic manifold device of other compressed gas equipment. We recommend that all our customers re-emphasize safety and safe handling practices to all their employees and customers. While every possible safety feature has been designed into the VLCDs and safe operations are anticipated, it is essential that the customer carefully read and fully understand all **WARNING** and **CAUTION** notes listed in the safety summary and enumerated below.

The system described in this manual holds and dispenses carbon dioxide (CO_2) gas under pressure. All persons using this equipment must read and understand the operation and safety information contained in this manual and must be adequately trained to operate this equipment.



WARNING: CO_2 gas is a colorless, odorless, tasteless gas that displaces oxygen and does not support life. The gas is difficult to detect without assistance of special equipment. Avoid breathing or contacting CO_2 in gas, liquid or solid form.

EXPOSURE TO CONCENTRATIONS OF MORE THAN 3% IN AIR CAN CAUSE UNCONSCIOUSNESS, SERIOUS INJURY, OR DEATH. Even low concentrations of CO_2 can cause:

-Dizziness, headaches, nausea, or disorientation
-Increased respiration or heart rate
-Shortness of breath or rapid suffocation

CO_2 is heavier than air and can collect in low areas such as basements, stairwells, and confined spaces. Avoid entry into areas, where CO_2 leaks or high concentrations of CO_2 are suspected. Enter those areas with caution only after they have been thoroughly ventilated.

WARNING: Before removing cylinder parts or fittings, completely empty the liquid cylinder of liquid and release the entire vapor pressure in a safe manner. External valves and fittings can become extremely cold and may cause painful burns to personnel unless properly protected. Personnel must wear protective gloves and eye protection whenever removing parts or loosening fittings. Failure to do so may result in personal injury because of the extreme cold and pressure in the cylinder.

CAUTION: Use only replacement equipment, which is compatible with oxygen and has been cleaned for oxygen use. Do not use regulators, fittings, hoses, etc., which have been previously used in a compressed air environment. Similarly, do not use oxygen equipment for compressed air. Failure to comply with these instructions may result in serious damage to the liquid cylinder.

CAUTION: The VLCD Series containers should be moved using a fork truck that lifts the cylinders from beneath the pallet. The VLCD must be used and stored in a vertical position. Do not lay, store, or ship a liquid cylinder on its side. Failure to comply with these procedures may result in damage to the liquid cylinder.

Handling the VLCD

The VLCD is mounted on a steel pallet. The preferred handling method is a forklift that lifts the pallet-mounted tank from beneath the pallet. However, overhead lifting by using lugs located on the top of the pallet or on top of the cylinder is permitted. Lifting of the VLCD should be performed only with equipment rated for the weight of the cylinder, pallet and contents combined (see specification section of this manual).

This container should remain upright at all times. Never lay the unit on its side to move or transport it. Careless handling can cause damage to the support system and internal plumbing, which may result in serious personal injury.

Shipping the VLCD

The transportation of the VLCD is permitted at pressures up to the relief valve setting. The inner vessel is coded per DOT 4L.

Inhalation of CO_2 Gas

If exposed to CO_2 gas, remove yourself or the individual to fresh air immediately. If the subject is not breathing, provide a means of artificial respiration. If there is difficulty breathing, an oxygen supply will be beneficial. Call a physician or paramedics for help.

Contact with Dry Ice

If exposed to dry ice, stop exposure at once. Do not pour water on wound. Seek immediate medical attention.

Spill or Leak Procedures

In the event of a CO_2 leak or spill, evacuate all personnel from the affected area. Ventilate the exposed area thoroughly before re-entering. Do not forget to ventilate any low areas, such as a basement or stairwells that may have collected Carbon Dioxide.

Filling Precautions

Always wear gloves and protective eyewear when making liquid CO_2 transfers. After filling the tank, close the liquid fill valve and open the drain valve. Remove the fill connection valve slowly to relieve pressure slowly from the line.

SECTION 4 INTRODUCTION

System Objective

The VLCD cryogenic container is one or two vacuum insulated cylinders that were designed to furnish liquid Carbon Dioxide on a reliable, economical basis. The tank is intended to fulfill the delivery requirements of medium-sized mini bulk distributors and installation start-ups.

The VLCD 950 will hold 950 pounds and the VLCD 1900 will hold 1900 pounds of liquid CO2 at a maximum pressure of 350 psig. The VLCD 1900 is simply two 950 pound tanks encased in a single pallet frame. Since the VLCD is larger than liquid cylinders there is no need to jumper tanks or force a transfer with high pressure cylinders. On the other hand, the VLCD is small enough for medium-sized distributors to afford. Two models also come with a flow meter to give the distributor the ability to accurately monitor the amount of product delivered at each location.

System Overview

The optional VLCD 950 model with Flow Meter comes with a Turbines Inc. Flow Meter. The flow meter is a turbine style with a temperature probe and can be used for Weights and Measures. The VLCD 1900 comes with a Flowcom Flow Meter. A printer can also be requested for the VLCD 1900. While the Flowcom is not Weights and measures approved, both flow meters allow the distributor to accurately monitor the amount of product delivered at each location.

The design and construction of the VLCD 950 and VLCD 1900 is aimed at building the most durable tank available today. Engineered as a complete delivery system, the VLCD includes an inner vertical stainless steel vacuum jacketed storage tank designed to the applicable pressure vessel code. The outer container is constructed of stainless steel to make the VLCD Series a maintenance free container. The VLCD Series is mounted in a rugged, carbon steel pallet frame.

The insulation system is comprised of multiple layers of foil and paper that are incorporated with a very low vacuum. The vacuum is factory sealed and with the aid of internal molecular sieve it should remain low for the life of the container. This insulation system coupled with low heat leak supports allows a small amount of heat into the inner vessel where it vaporizes liquid. If the container is left unused for a period of time the pressure will build to the safety relief valve setting.

The inner pressure vessel is protected from over-pressurization by 2 primary safety relief valves set at 350 psig and one rupture disc set at 584 psig or a maximum of 1.5 times the MAWP.

Responsibilities of Distributor and Fillers of Liquid Cylinders

Chart is stating below the responsibilities of the filler for any VLCD Series container.

1. The cylinder must be in safe condition.

The filler is responsible for confirming that any VLCD to be filled is in its proper working condition. This includes that:

- It has an acceptable vacuum.
- The relief system is in place and functioning.
- There is no structural damage to the cylinder.
- All warning labels are in place and legible.

2. Do not overfill.

The VLCD Series containers are not to be filled beyond the recommended filling limits described in this manual.

3. Dispense only to knowledgeable users.

The filler must determine that the user is knowledgeable about the general characteristics of the product and proper safety precautions for its use. Do not allow customers to fill their own cylinders.

4. Dispose of cylinders properly.

To eliminate the risk of injury from the improper reuse of cryogenic (vacuum jacketed) cylinders, before disposal, destroy the cylinder's pressure retaining capability.

We recommend:

1. Purge the cylinder's contents.

2. Drill multiple holes through the cylinder and its vacuum casing or otherwise puncture the tank.

Do it yourself! Don't assume it will be done by the scrap dealer.

SECTION 5 GENERAL DESCRIPTION

Plumbing Components

The plumbing components on the tank carry out five functions:

- Liquid Fill
- Liquid Delivery
- Gas Delivery (only in VLCD 950 w/ Flow Meter)
- Pressure Maintenance
- Pressure Relief

Each function of the tank is carried out by its own circuit except for pressure relief. First, the fill circuit allows liquid CO_2 to be dispensed from the mother tank into the VLCD. Second, the liquid delivery circuit dispenses the product from the VLCD into a mini bulk tank. Third, the gas delivery can be used to purge and pressurize the mini bulk tank. Fourth, the pressure building circuit converts liquid CO_2 to a gas to maintain pressure within the tank. Finally, the pressure relief circuits allow the tank to be vented manually or automatically. Excess pressure in the tank may be relieved by the Safety Pressure Relief Circuit, the Auxiliary Pressure Relief Circuit or the Manual Vent Line.

Pressure Building Circuit

The pressure building circuit withdraws liquid CO_2 from the bottom of the inner vessel, takes in heat with the help of the external vaporizer, and delivers the CO_2, in the form of a gas, to the head space of the tank. It consists of an external vaporizer, isolation valves, and a pressure building regulator.

Pressure Building Vaporizer

The pressure building vaporizer is a vertical aluminum fin coil mounted to the main support frame.

Pressure Building Regulator

The pressure building regulator is factory set at 300 psi and should not be adjusted. It is designed to maintain the tank pressure at 300 psi and has 1/2" FPT ports.

Pressure Building Isolation Valves

The pressure building valves are 1/2" FPT brass ball valves. They are intended to isolate the pressure building regulator should it need to be replaced or serviced. Make sure the handles of both valves are in line with the circuit while operation the tank.

Safety Pressure Relief Circuit

Since the tank is an ASME Section VIII, Division 1 coded vessel, it requires safety relief devices approved by ASME. The VLCD 950 and 1900 are equipped with dual relief valves

set at 350 psi. This relief valve cannot be completely isolated. There is a 3-way valve that can be positioned to isolate one relief valve at one time. This is so one relief valve may be replaced or inspected while the other valve still remains in-line as a safety relief device. The 584 psig rupture disc cannot be isolated and once ruptured, it must be replaced.

Manual Vent Circuit

The manual vent circuit allows the tank to be quickly vented and/or supply pressure to a mini-bulk tank.

Liquid Fill Line

The liquid fill line has the same internal design as the mini-bulk tanks with an additional check valve between the ball valve and the tank.

Liquid Fill Line Isolation Valve

The isolation valve is a 1/2" brass ball valve

Liquid Delivery Line

Extending from the internal dip tube, the liquid delivery line exits the knuckle, traverses the entire length of the tank to a 1/2" ball valve. Each component in the line is described below.

Liquid Delivery Line Isolation Valve

The liquid delivery isolation valve controls the delivery process. The valve is a 1/2" ball valve to minimize flow restriction. The valve is open when the handle is in line with the circuit.

Strainer

The bronze 1/2" strainer filters out particles which may be in the CO_2 supply. It also straightens the flow for accurate meter reading.

Metering Section (VLCD 1900)

The welded 3/4" metering section has a restriction inside which creates a differential pressure in the flowing product. The differential pressure is then measured, converted to an electrical signal and then used to calculate flow rate and total quantity delivered by the flow processor.

Line Drain Valve

The line drain valve is a 1/2" FPT ball valve. It is used to drain the line pressure after a delivery has been made.

Line Pressure Relief Valve
The line pressure relief valve relieves the line pressure if liquid is trapped between two isolating components.

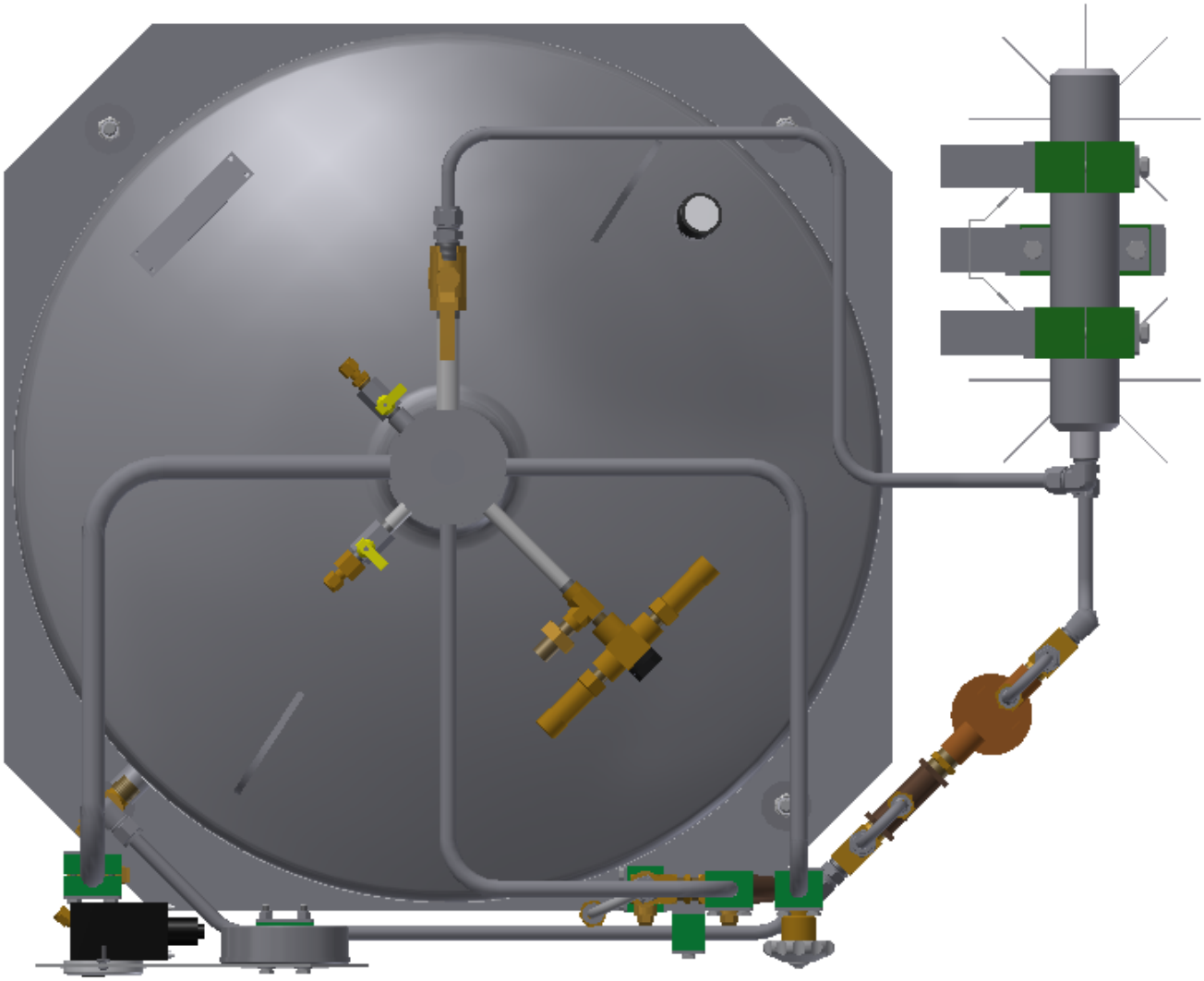
Differential Pressure Gauge Assembly
The differential pressure gauge assembly allows the user to monitor the quantity of liquid product in the tank.

Knuckle Plug
The knuckle plug is the threaded portion which screws into the top of the knuckle.

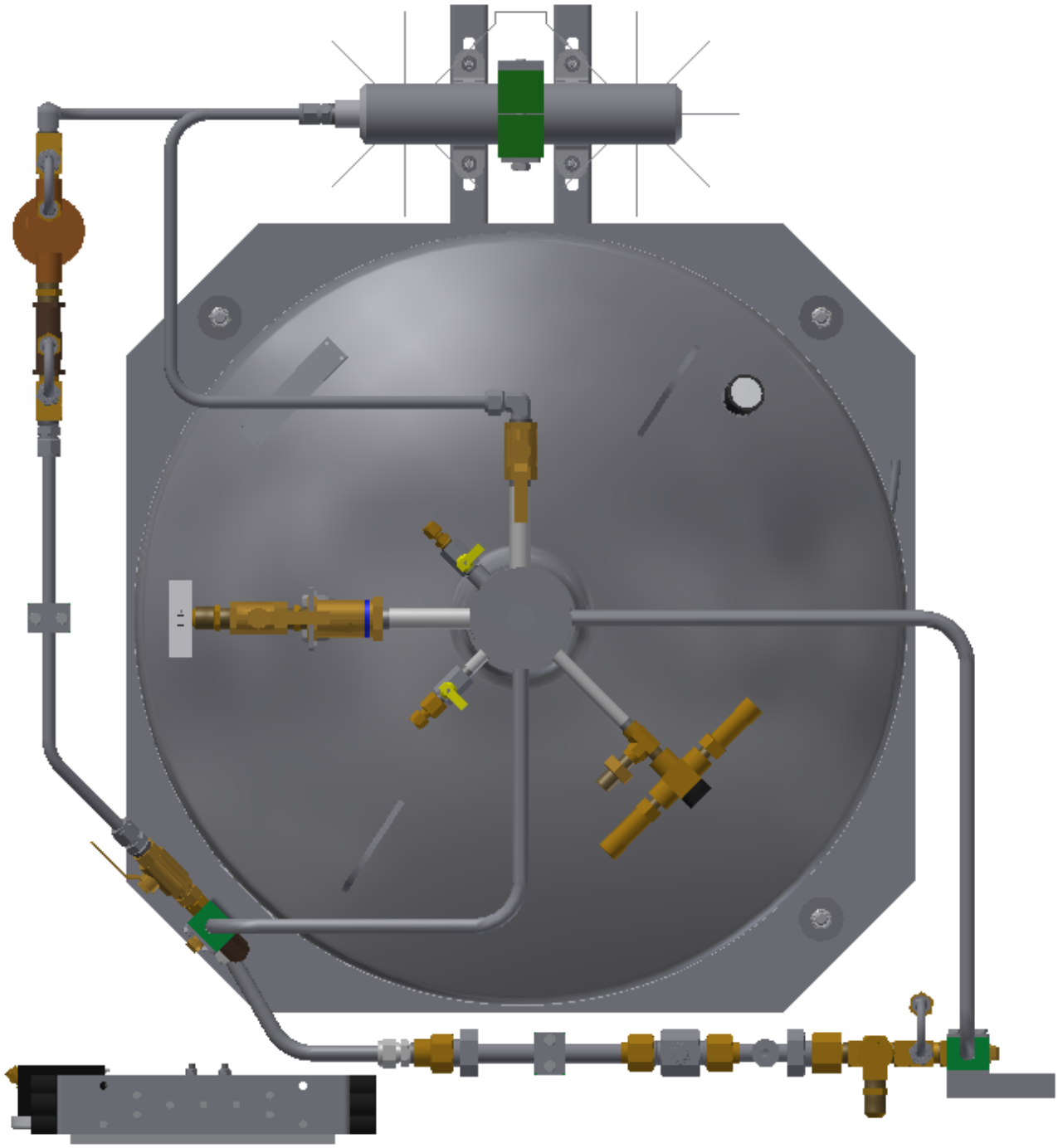
SECTION 6 GENERAL ARRANGEMENT and FLOW SCHEMATICS

General Arrangement Drawing VLCD Top View

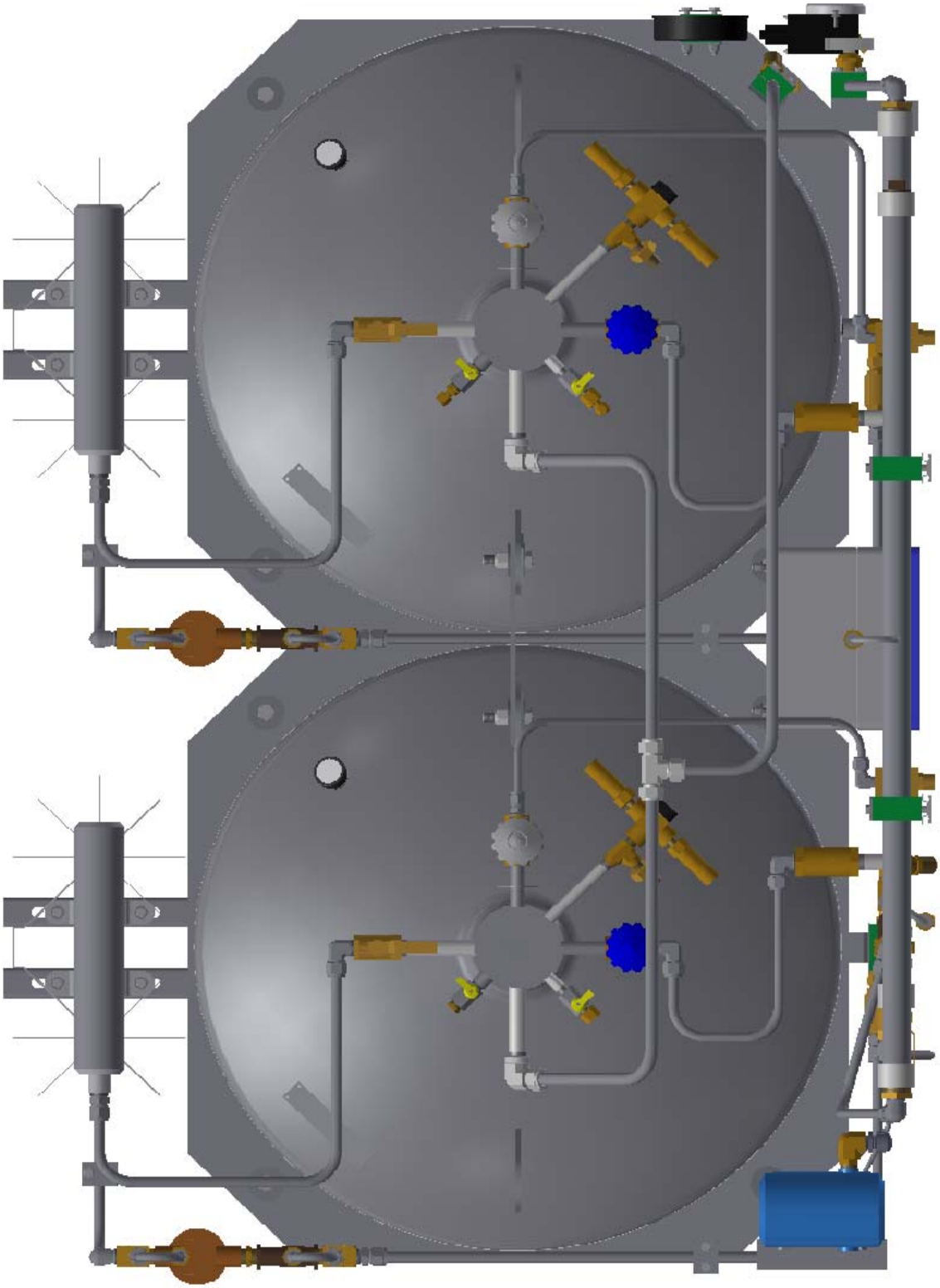
VLCD-950 Single Unit



VLCD 950 w/ Flow Meter

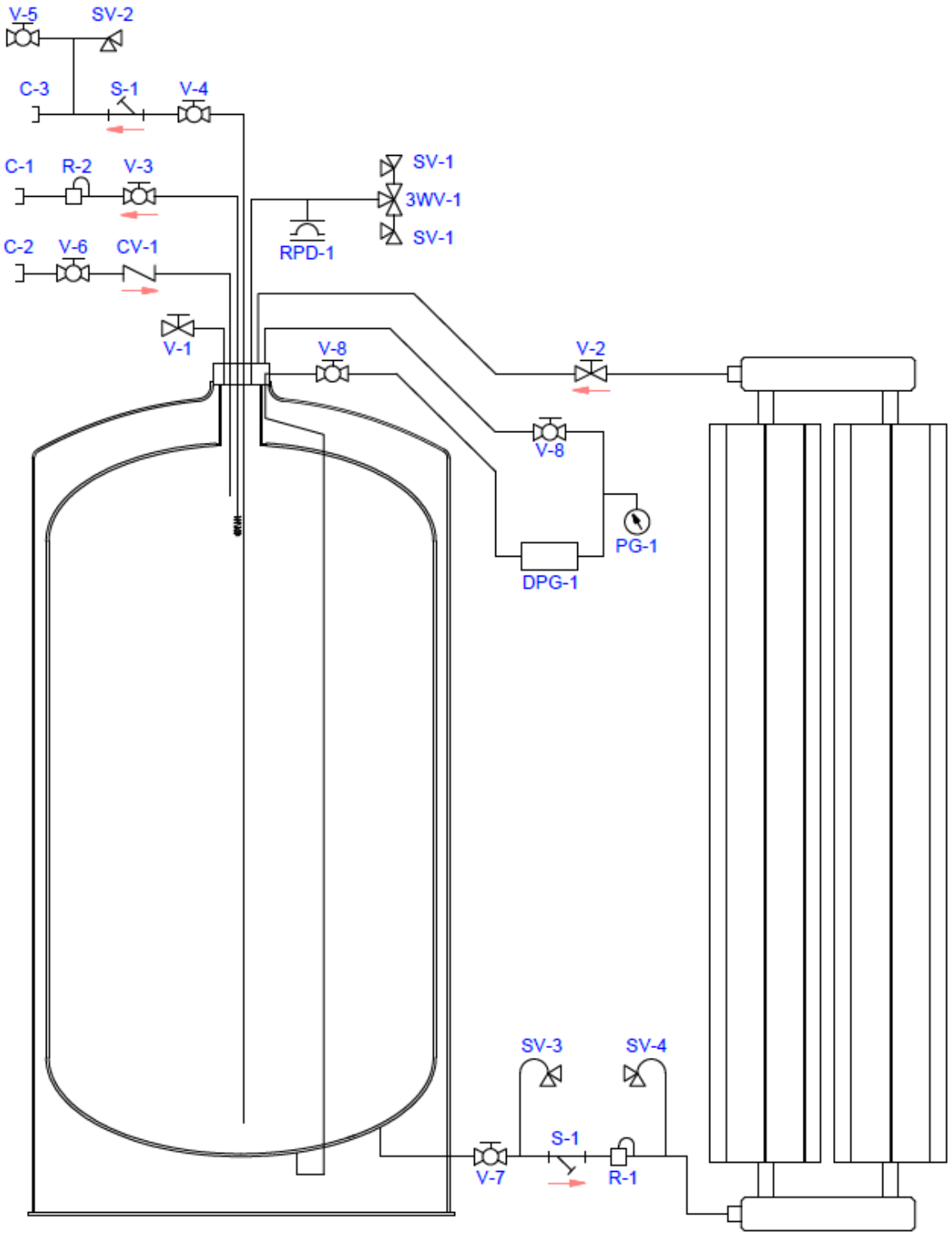


VLCD 1900



Flow Schematics and Nomenclature

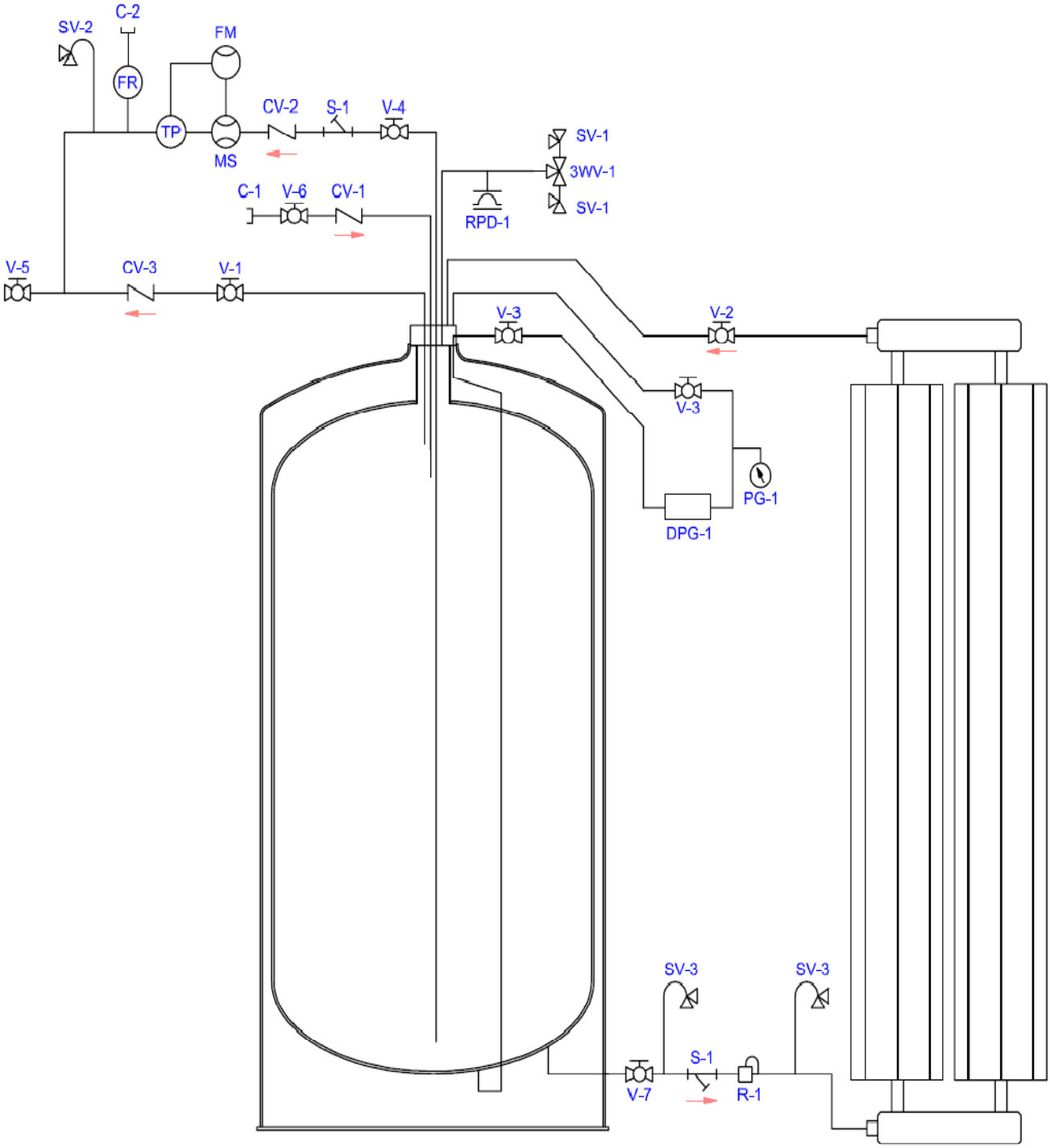
Flow Diagram VLCD 950 Single Unit



Nomenclature (VLCD 950 Single Unit)

NOMENCLATURE	
DESIGNATION	DESCRIPTION
V-1	VENT SHUT-OFF VALVE
V-2	PRESSURE BUILDING RETURN SHUT-OFF VALVE
V-3	SUREFILL SHUT-OFF VALVE
V-4	LIQUID DELIVERY SHUT-OFF VALVE
V-5	LIQUID DELIVERY DRAIN SHUT-OFF VALVE
V-6	FILL SHUT-OFF VALVE
V-7	PRESSURE BUILDING SHUT-OFF VALVE
V-8	ISOLATION VALVE
SV-1	PRIMARY TANK SAFETY PRESSURE RELIEF 350 PSI
SV-2	LIQUID DELIVERY SAFETY PRESSURE RELIEF 450 PSI
SV-3	PRESSURE BUILDING CIRCUIT PRESSURE RELIEF 500 PSI
RPD-1	SECONDARY TANK SAFETY PRESSURE RELIEF 450 PSI
R-1	PRESSURE BUILDING CIRCUIT REGULATOR SET @ 300 PSI
R-2	SUREFILL REGULATOR @ 325 PSI
S-1	STRAINER
C-1	SUREFILL CONNECTION
C-2	TANK LIQUID FILL CONNECTION
C-3	LIQUID DELIVERY CONNECTION
PG-1	TANK PRESSURE GAUGE
DPG-1	DIFFERENTIAL PRESSURE GAUGE-INDICATES AMOUNT OF LIQUID CO2 IN TANK
CV-1	FILL CHECK VALVE
3WV-1	3-WAY VALVE (PRIMARY/SECONDARY TANK SAFETY RELIEF)

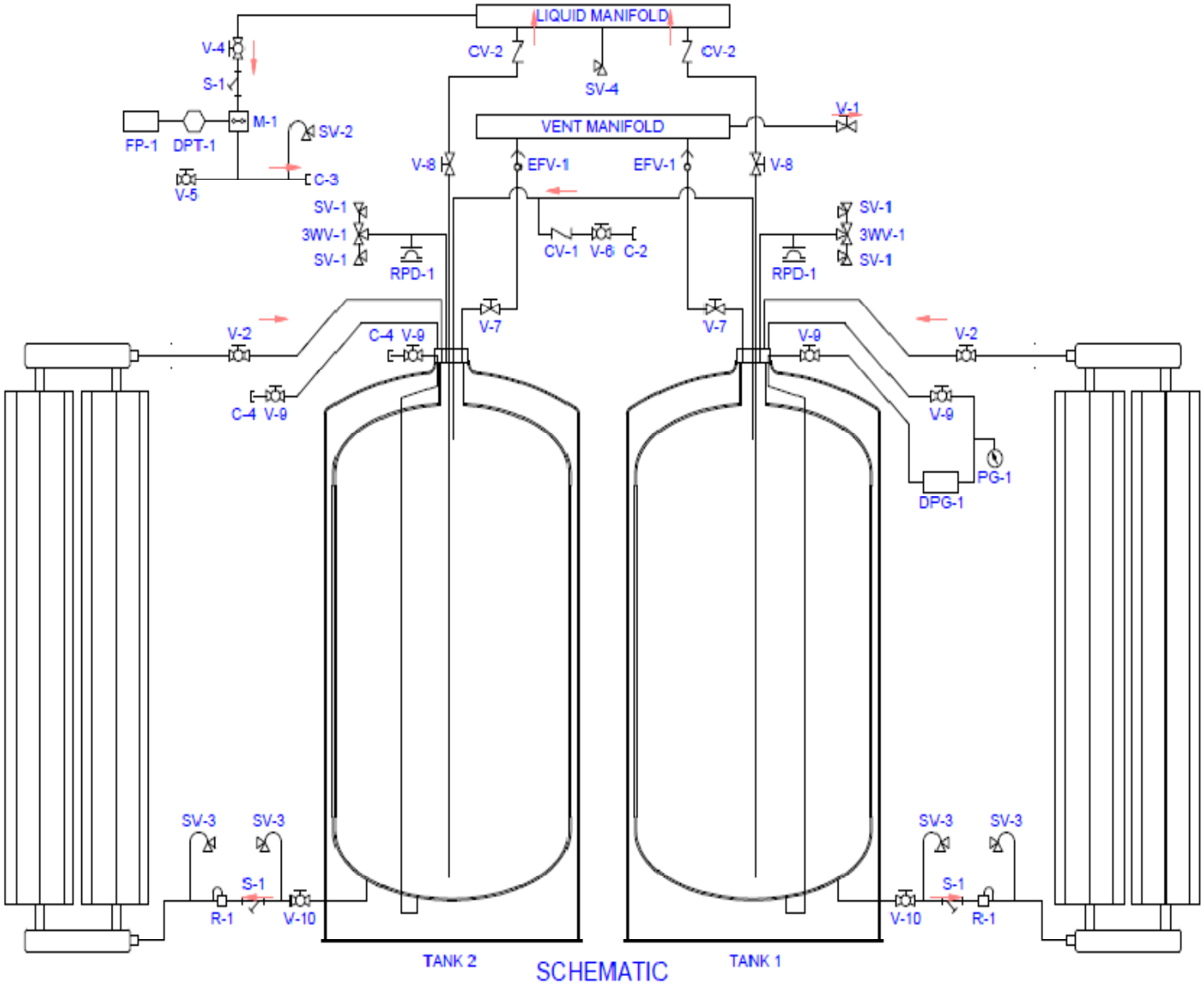
Flow Diagram VLCD 950 w/ Flow Meter



Nomenclature (VLCD 950 w/ Flow Meter)

NOMENCLATURE	
DESIGNATION	DESCRIPTION
V-1	VENT SHUT-OFF VALVE
V-2	PRESSURE BUILDING RETURN SHUT-OFF VALVE
V-3	ISOLATION VALVE
V-4	LIQUID DELIVERY SHUT-OFF VALVE
V-5	LIQUID DELIVERY DRAIN SHUT-OFF VALVE
V-6	FILL SHUT-OFF VALVE
V-7	PRESSURE BUILDING SHUT-OFF VALVE
SV-1	PRIMARY TANK SAFETY PRESSURE RELIEF 350 PSI
SV-2	LIQUID DELIVERY SAFETY PRESSURE RELIEF 450 PSI
SV-3	PRESSURE BUILDING CIRCUIT PRESSURE RELIEF 550 PSI
RPD-1	SECONDARY TANK SAFETY PRESSURE RELIEF 450 PSI
R-1	PRESSURE BUILDING CIRCUIT REGULATOR SET @ 300 PSI
S-1	STRAINER
C-1	TANK LIQUID FILL CONNECTION
C-2	LIQUID DELIVERY CONNECTION
PG-1	TANK PRESSURE GAUGE
DPG-1	DIFFERENTIAL PRESSURE GAUGE-INDICATES AMOUNT OF LIQUID CO2 IN TANK
CV-1	FILL CHECK VALVE
CV-2	LIQUID DELIVERY CHECK VALVE
CV-3	VENT CHECK VALVE
3WV-1	3-WAY VALVE (PRIMARY/SECONDARY TANK SAFETY RELIEF)
MS	METERING SECTION
FM	FLOW METER
TP	TEMPERATURE PROBE
FR	FLOW RESTRICTOR

Flow Diagram 1900



Nomenclature (VLCD 1900)

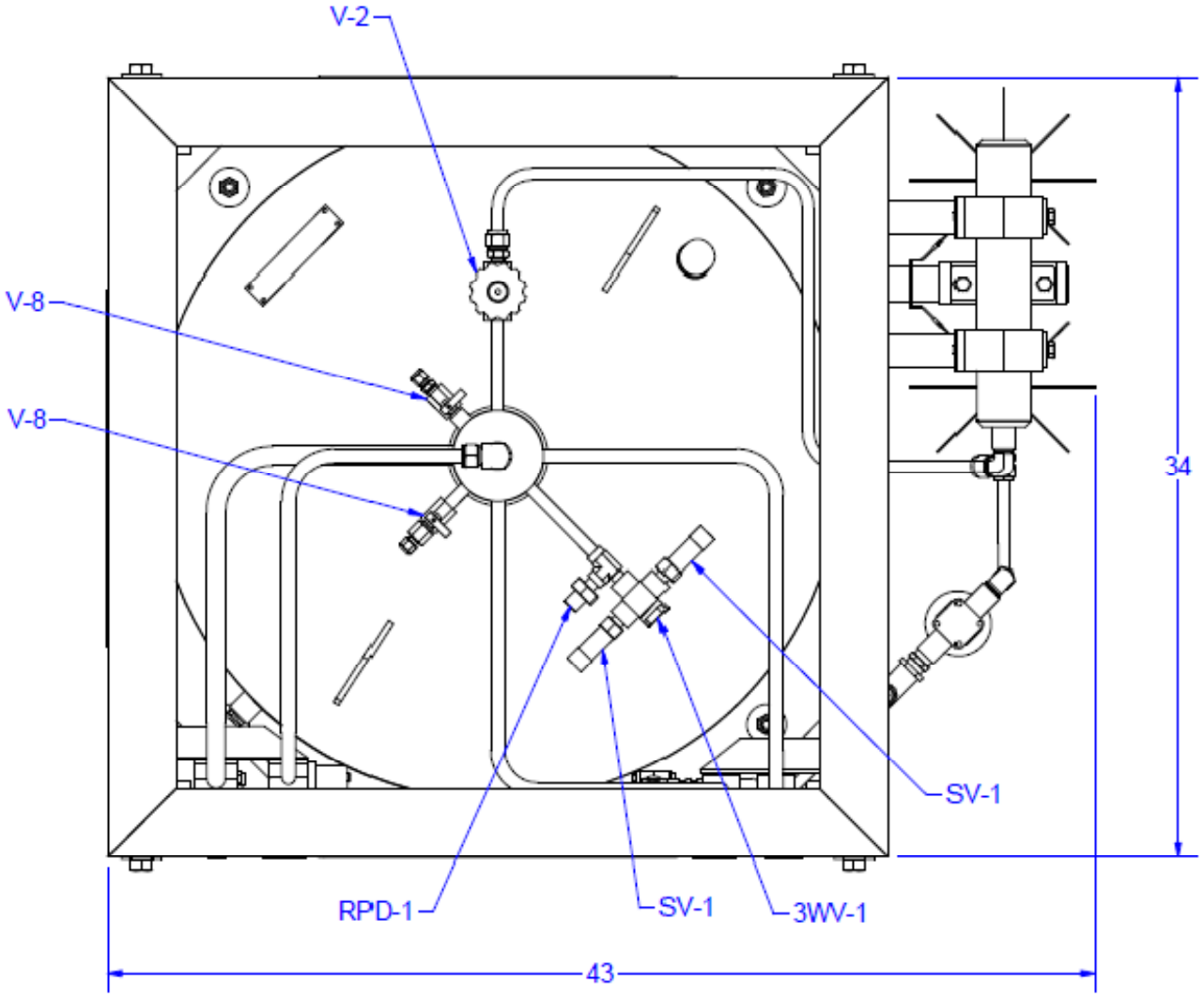
NOMENCLATURE	
DESIGNATION	DESCRIPTION
V-1	VENT SHUT-OFF VALVE FROM VENT MANIFOLD
V-2	PRESSURE BUILDING RETURN SHUT-OFF VALVE
V-4	LIQUID DELIVERY SHUT-OFF VALVE
V-5	LIQUID DELIVERY DRAIN SHUT-OFF VALVE
V-6	FILL SHUT-OFF VALVE
V-7	TANK VENT SHUT-OFF VALVE
V-8	TANK LIQUID SHUT-OFF VALVE
V-9	ISOLATION VALVE
V-10	PRESSURE BUILDING SHUT-OFF VALVE
SV-1	PRIMARY TANK SAFETY PRESSURE RELIEF 350 PSI
SV-2	LIQUID DELIVERY SAFETY PRESSURE RELIEF 450 PSI
SV-3	PRESSURE BUILDING CIRCUIT PRESSURE RELIEF 500 PSI
SV-4	LIQUID MANIFOLD PRESSURE RELIEF 500 PSI
RPD-1	SECONDARY TANK SAFETY PRESSURE RELIEF 450 PSI
R-1	PRESSURE BUILDING CIRCUIT REGULATOR SET @ 300 PSI
S-1	STRAINER
M-1	METERING SECTION - CREATES DIFFERENTIAL PRESSURE IN FLOW
C-2	TANK LIQUID FILL CONNECTION
C-3	LIQUID DELIVERY CONNECTOIN
C-4	TANK 2 GPL/LPH CAP
PG-1	TANK PRESSURE GAUGE
DPG-1	DIFFERENTIAL PRESSURE GAUGE - INDICATES AMOUNT OF LIQUID CO2 IN TANK
DPT-1	DIFFERENTIAL PRESSURE TRANSMITTER
FP-1	FLOW PROCESSOR
CV-1	FILL CHECK VALVE
CV-2	LIQUID TO MANIFOLD CHECK VALVE
EFV-1	EXCESS FLOW VALVE
3WV-1	3-WAY VALVE (PRIMARY/SECONDARY TANK SAFETY RELIEF)

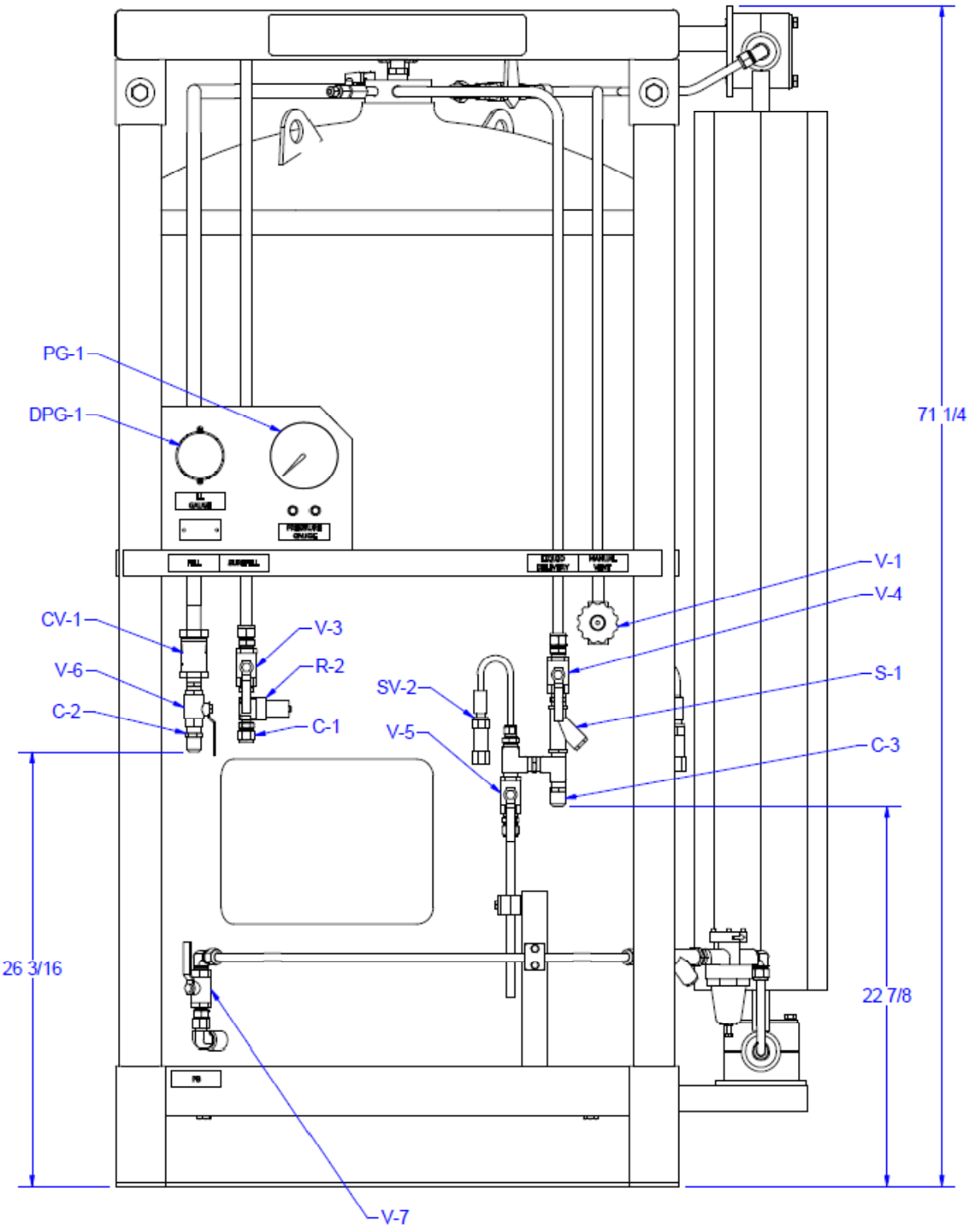
SECTION 7 SPECIFICATIONS and PALLET DIMENSIONS

VLCD 950 Single Unit

DESIGN SPECIFICATIONS

CAPACITY:	950 LB OF CO2
RELIEF VALVE SETTING:	350 PSI / 24.1 BAR
RUPTURE DISC SETTING:	450 PSI / 31.0 BAR
MATERIALS OF CONSTRUCTION:	T304 STAINLESS STEEL
EMPTY WEIGHT:	1150 LB. / 522 KG
FILLED WEIGHT (@300 PSI LIQUID CO2)	2180 LB. / 989 KG

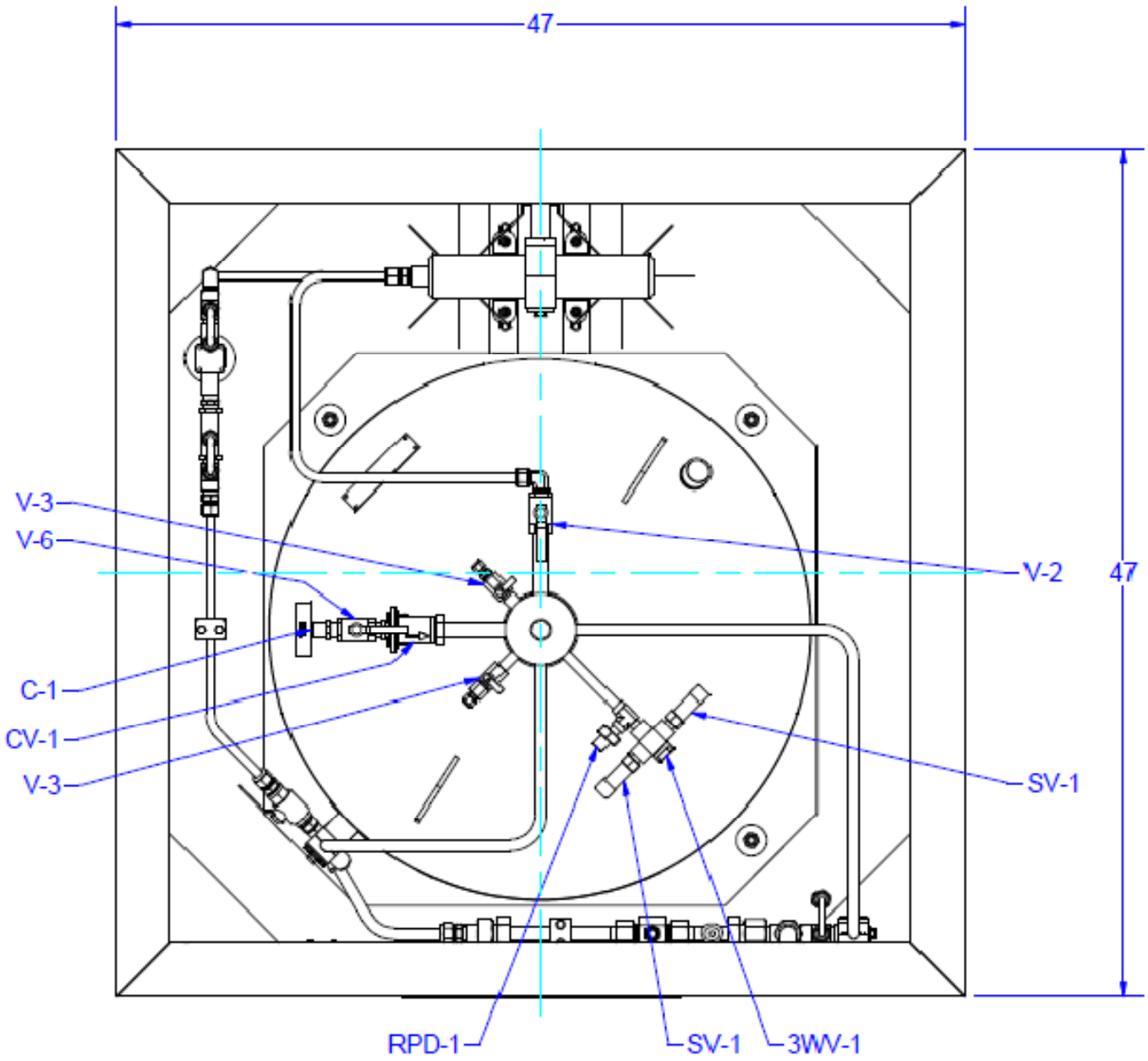


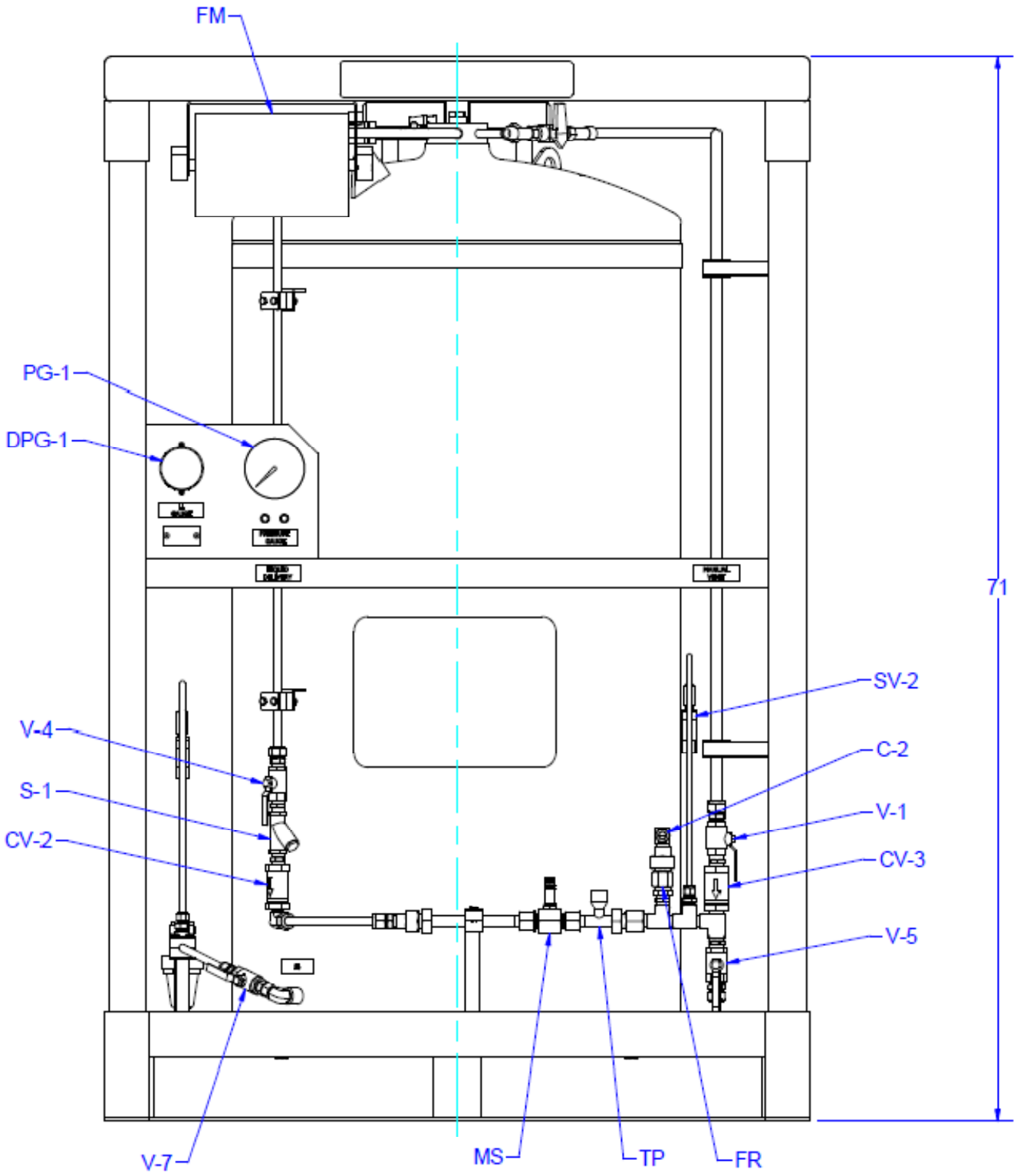

PG-1
DPG-1
CV-1
V-6
C-2
V-3
R-2
C-1
SV-2
V-5
V-1
V-4
S-1
C-3
V-7
71 1/4
26 3/16
22 7/8

VLCD 950 w/ Flow Meter

DESIGN SPECIFICATIONS

CAPACITY:	950 LB OF CO2
RELIEF VALVE SETTING:	350 PSI / 24.1 BAR
RUPTURE DISC SETTING:	450 PSI / 31.0 BAR
MATERIALS OF CONSTRUCTION:	T304 STAINLESS STEEL
EMPTY WEIGHT:	1275 LB. / 578 KG
FILLED WEIGHT (@300 PSI LIQUID CO2)	2305 LB. / 1046 KG

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V-7
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FR
SV-2
C-2
V-1
CV-3
V-5
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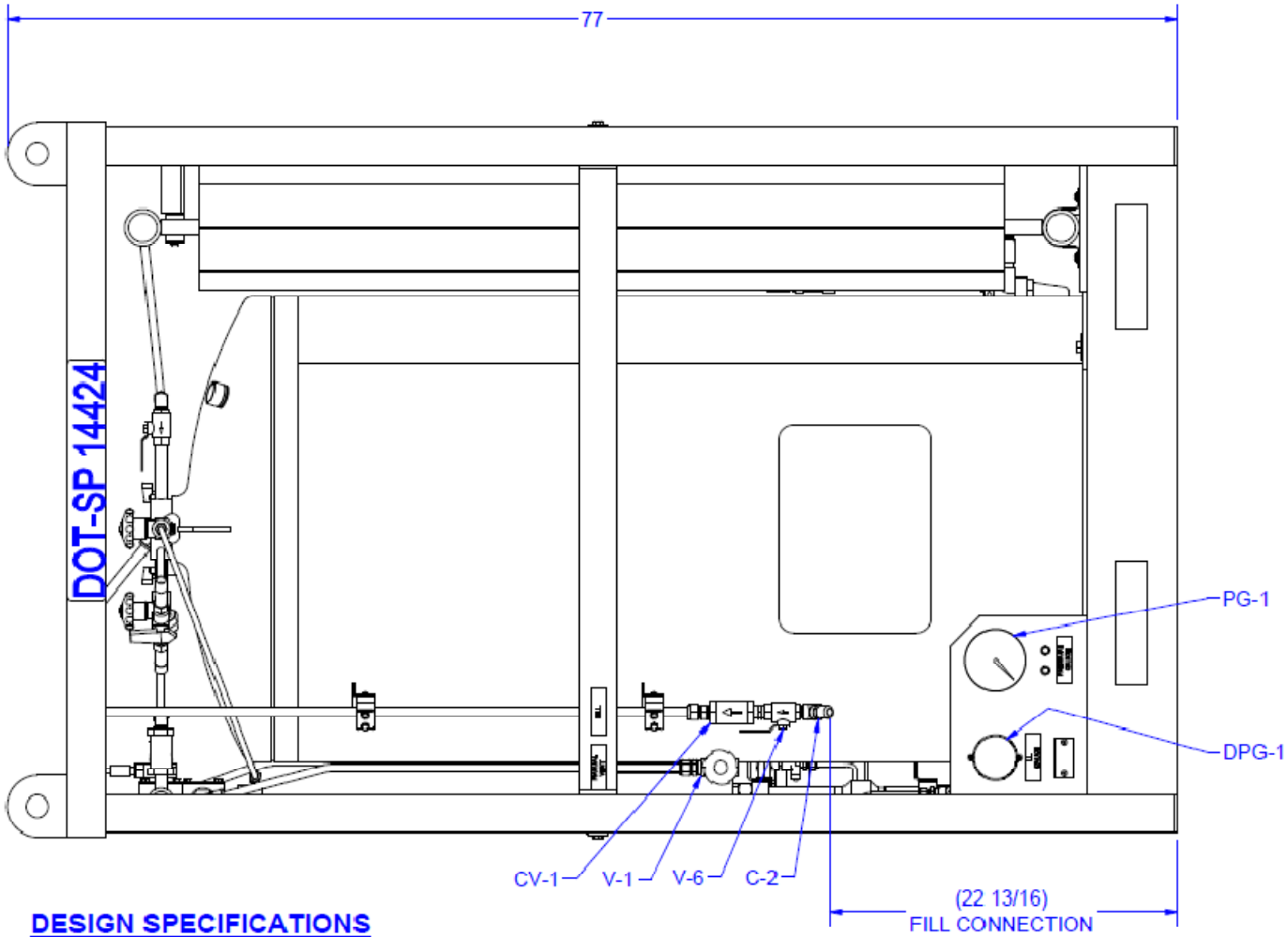
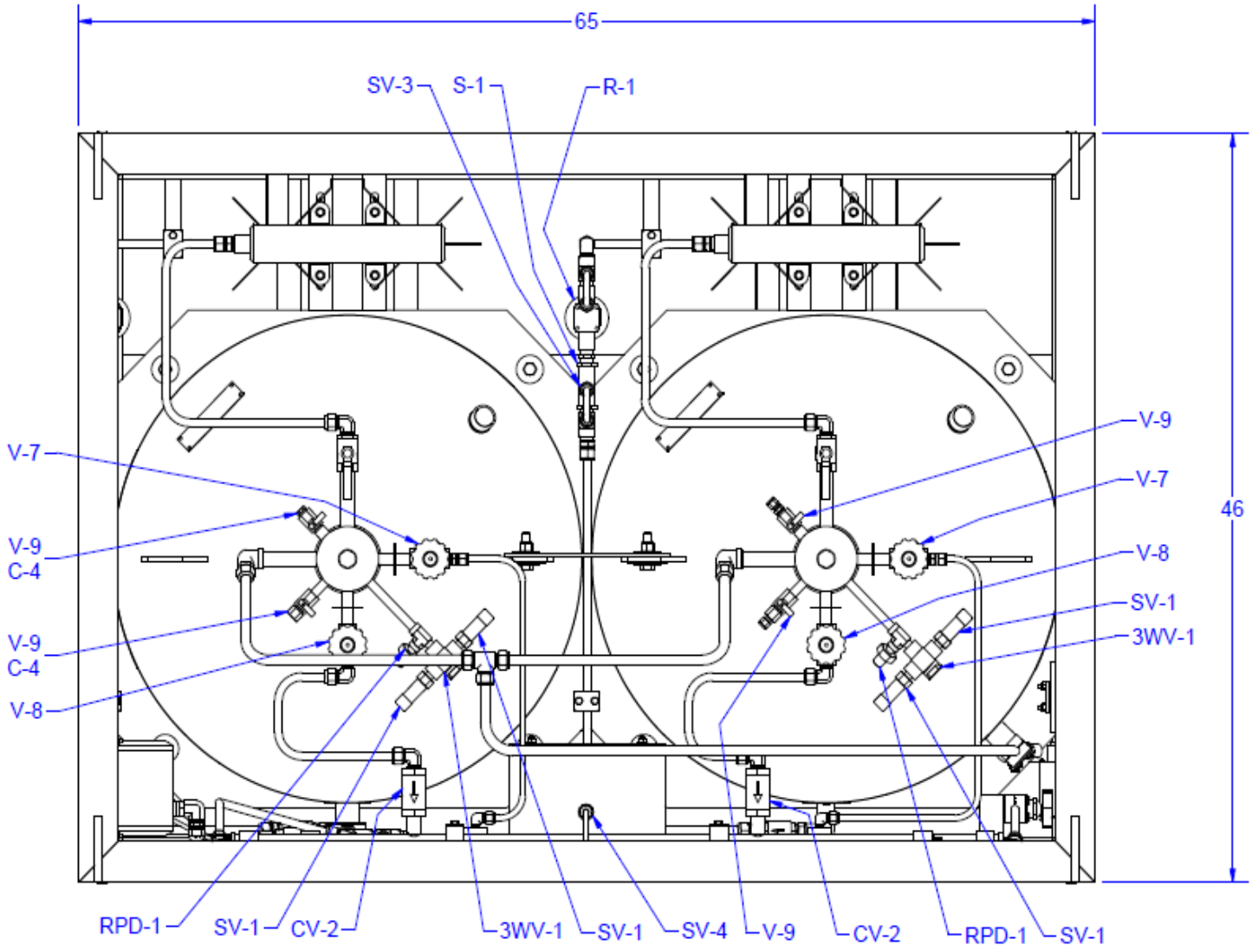
VLCD 1900



DESIGN SPECIFICATIONS

CAPACITY:	1900 LB OF CO2
RELIEF VALVE SETTING:	350 PSI / 24.1 BAR
RUPTURE DISC SETTING:	450 PSI / 31.0 BAR
MATERIALS OF CONSTRUCTION:	T304 STAINLESS STEEL
EMPTY WEIGHT:	2377 LB. / 1078 KG
FILLED WEIGHT (@300 PSI LIQUID CO2)	4430 LB. / 2009 KG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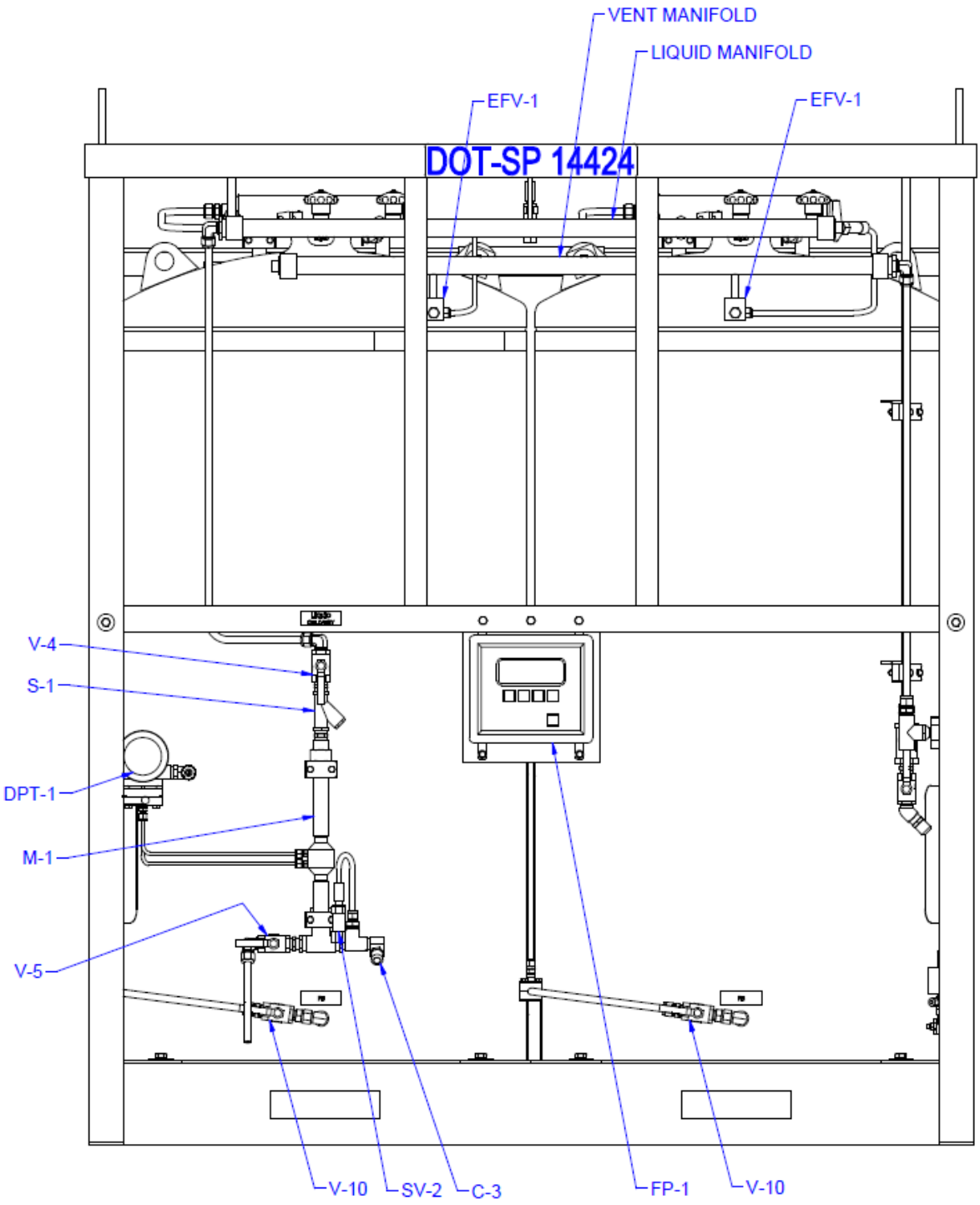
RPD-1
SV-1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LIQUID MANIFOLD
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EFV-1
DOT-SP 14424
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S-1
DPT-1
M-1
V-5
V-10
SV-2
C-3
FP-1
V-10

SECTION 8 OPERATIONS

Initial Inspections

When the container is first received it should be inspected for shipping damage. Never fill a damaged container.

All VLCDs are shipped with NF grade nitrogen gas in them. For this reason the VLCD should be thoroughly purged with CO2 gas. If the VLCD arrives with zero pressure, it should be pressurized and checked for leaks.

Filling Procedures

The VLCD 950 and VLCD 1900 may be filled with liquid from a liquid supply unit using a pumping transfer or via pressure transfer.

Before filling the cylinder it should be visually inspected for possible damage or unsuitability for intended use. If damage is detected (e.g., serious dents, loose fittings, etc.), remove the unit from service and conduct the necessary repairs as soon as possible.

Filling the VLCD 950 and VLCD 1900

The VLCD 950 and VLCD 1900 are operated under a special permit pertaining to DOT Code 49 CFR 177.834 for transporting liquid carbon dioxide to be used in filling stationary liquid carbon dioxide tanks. The maximum allowable filling density must not exceed 97.3 percent. The VLCD contains a vent/trycock tube. The unit can be filled to this vent/trycock tube. The vent/trycock tube is the correct length according to filling regulations for such a vessel. This will allow enough gas space above the liquid to keep the VLCD from becoming liquid full if its pressure rises to the relief valve setting. Seeing as the VLCD unit is bolted down inside a truck or van, filling the vessel by product weight would be difficult. The standard relief valve setting for the VLCD 950 and VLCD 1900 is 350 psi.

Filling can be accomplished by pump fill or pressure transfer. The following procedure should be used, (Ref. #'s used below correspond with Section 5 schematics).

1. Sample the residual gas that is in the VLCD. Purge the cylinder if necessary to insure the proper purity.

2. Check to see that the VLCD is pressurized to at least 70psi, but less than 150psi.

3. Connect the transfer hose to the liquid fill valve.

4. If a crossover valve is on the bulk tank fill hose assembly, open it and pressurize the transfer hose.

5. Make sure the VLCD Vent Circuit diverter valve is open. Open the liquid fill valve. Slowly open the transfer line shut-off valve to begin the flow of product.

6. Monitor the liquid level gauge on the VLCD as the filling process takes place.

7. Monitor the VLCD's tank pressure gauge as it fills.

8. Maintain at least a 50psi differential between the bulk tank and the VLCD by controlling the flow through the vent valve.

9. Once the pressure in the vessel approaches 300psi, shut the transfer line valve. Vent the tank down through the "fill gun". Do not let the pressure in the VLCD drop below 100psi. Begin filling again.

10. Repeat Step 9 until "snow" or liquid is vented through the gun or liquid starts to exit through the vent valve.

11. If a crossover valve is available, open it now to push the remaining liquid CO_2 out of the hose and into the VLCD.

12. Next, close the VLCD's vent valve then close the VLCD fill valve.

13. If a crossover valve is not available, quickly open the line drain valve on the mother tank to vent the delivery hose.

14. Disconnect the delivery hose from the VLCD and return it to its storage hook or reel.

At this point, the VLCD should contain pounds of liquid CO_2 at a pressure of 300 psi in a preferable location such as on a truck bed. Given these conditions, the tank is now ready to be used to deliver bulk CO_2.

CAUTION: All valves on an empty VLCD should always be kept closed to protect the inner vessel and plumbing from being contaminated.

The operator should review the safety precautions found in Section 3 “Safety” before conducting a gas or liquid withdrawal operation. Protective eye glasses and gloves should always be worn.

CAUTION: Pressure should be allowed to escape from the transfer hose before it is completely removed. A hose drain and relief valve are in the delivery circuit on the VLCD.

Delivering Liquid CO_2

The delivery process is somewhat complicated by the fact that there are a number of different tank, fill box and fill line designs on the market. However, there are enough similarities so that general rules may be followed. The generalized procedure for filling restaurant bulk CO_2 tanks is described below.

1. Locate the VLCD as near as possible to the fill station.
2. Put on work gloves and eye protection.
3. Open the pressure building feed valve to start building pressure in the VLCD.
4. Unlock the fill station and inspect the fill fitting and the box's general condition.
5. Do not attempt to make a delivery if the fill fitting is damaged, the box is in poor condition or if the box is located below grade or in a confined space.
6. Exercise good judgment and do not underestimate the physiological effects CO_2 may have on you.
7. If satisfied with the appearance and condition of the fill fitting inspect the contents gauge on the store tank to predict the amount of product that will be delivered.
8. Remove the fill hose from its storage hooks or hose reel and connect the fill hose to the fill box fitting.
9. Make sure the fittings are completely tight such that the circular slot on the fill fitting is even with the end of the hose fitting.
10. Check the line pressure gauge to determine the store tank pressure.
11. If the line pressure gauge reads zero, the store tank either has a one way check valve or a fill line isolation valve which is closed.
12. Open the store tanks fill line isolation valve if necessary and check the pressure once again.
13. Once satisfied that the VLCD has approximately 300 psi and the store tank fill line is open and has approximately 125psi, close the hose drain valve.
14. Open the vent valve to pressurize the delivery hose.
15. Close the vent valve.
16. Open the VLCD's liquid delivery valve slowly at first and then open it gradually while monitoring the flow meter.
17. At any point in the fill process you may close the liquid delivery valve and check the pressure or liquid contents of either tank.
18. When store tank is full, close the liquid delivery valve.
19. Close the pressure building feed valve.
20. Open the line drain valve allowing the liquid trapped in the hose to escape.

21. Once the escaping fluid in the hose changes from a liquid to a gas close the line drain valve.
22. Disconnect the fill fitting from the fill box slowly, allowing gas to escape.
23. Return the fill hose to the hose hooks or hose reel.
24. Open the line drain valve to allow any gas left in the hose to escape.
25. Remove eye protection and gloves.

CAUTION: The container can become contaminated once it is emptied, if the liquid and vent valves are not closed.

Venting the VLCD

The VLCD may be vented to protect the primary relief valve, to decrease the time required to fill the VLCD, or to achieve other goals. The manual vent line may be used for this purpose.

Manual Venting

The manual vent valve may be used for this purpose. If the tank needs to be vented, open the valve to achieve the desired rate. Always vent the tank outdoors either by placing the tank outside or by routing a vent hose out of the building. Secure the exhaust end of the hose so that it does not whip about while in use.

Pressurizing the Tank

The VLCD may be pressurized by using the external aluminum vaporizer.

Pressure Building

If the pressure in the tank is below 300psi, the pressure building circuit may be used to generate pressure in the tank. Open the pressure building feed isolation valve to allow liquid to enter the coil. The effectiveness of the pressure building circuit depends on the energy state of the liquid inside the tank. For example, if the tank pressure is maintained at 100psi for a long period of time, the energy state of the liquid will be much lower than is the tank was maintained at 300psi. As a result, the pressure building rate will be lower for the tank when it is maintained at 100psi, rather than at 300psi. In summary, maintaining the tank near 300psi will maximize its performance. THE PRESSURE BUILDING RETURN VALVE SHOULD REMAIN OPEN DURING NORMAL OPERATION AND TRANSPORTATION.

SECTION 9 TROUBLESHOOTING

Problem	Probable Cause	Corrective Action
VLCD builds excessive pressure or builds pressure too fast	Low usage.	If daily usage is under 100 SCF, the cylinder will build pressure. In liquid service, the cylinder should be equipped with low pressure relief valve and regulator.
	Cylinder is over filled.	If the cylinder is filled past the vent trycock or past the DOT specified fill weight, the pressure may rise rapidly after a fill.
	Pressure building regulator is set improperly or leaks.	If the pressure builds and stays at a pressure higher than desired, adjust the pressure building regulator to a new setting.
		If the pressure builds to the relief valve setting and the PB feed line is frosted, replace the regulator.
	Vacuum is deteriorating.	This can be accompanied by cold or frost occurring evenly over the cylinder surface. Refer to the troubleshooting section on frost.
	Pressure building valve is open.	Close valve
VLCD pressure is too low or does not build pressure at a sufficient rate	Pressure building regulator is set too low.	If the pressure does not build and stays at a setting lower than desired, adjust the pressure building regulator to a new setting. Turn the adjustment screw clockwise to raise the pressure setting.
	Energy level of liquid in tank is low	The pressure building rate for product stored at a lower pressure will be slower than a product stored at a higher pressure. To achieve best results, maintain the tank pressure at the working pressure of 300psi.
	Cylinder is leaking.	Check for frost on lines or on top of head. Listen for hissing, soap test joints for leaks. Isolate leak and call Chart for repair details.

Problem	Probable Cause	Corrective Action
VLCD pressure is too low or does not build pressure at a sufficient rate	Strainer may be plugged	Isolate system, relieve pressure, take the strainer apart and check the screen.
	Tank is contaminated with moisture or CO_2 byproducts	Contaminants such as water will freeze in solution with liquid CO_2 preventing adequate flow of product into the pressure building feed line. After the VLCD has been emptied, purge the tank with 50°C - 100°C nitrogen for 12 hours or more. Purge CO_2 byproducts out through the PB feed line. After donning safety glasses and gloves place a rag over the PB feed line outlet and open the valve briefly. Inspect the cloth for discoloration or impurities. Repeat until all impurities are removed.
Frost occurs on head or knuckle.	Residual frost remains from last fill or recent product use.	This is normal. Ice may remain for days after a fill or heavy use.
Frost occurs evenly over the cylinder surface.	Cylinder has lost vacuum.	This is accompanied by high rate of pressure rise or high loss rate. Call Chart for return instructions.
Miscellaneous frost spots on cylinder.	Cylinder may have internal damage.	Call Chart for evaluation or repair/return instructions.
In CO_2 service, cylinder does not deliver product properly.	Possible dry ice blocks have formed in system.	Pressurize the cylinder to 100 psi or above to re-liquefy from CO2 dry ice.

SECTION 10 MAINTENANCE

Rebuilding or Replacing the Operational Valves

The valves that are used on the VLCD models have a spring loaded rotary stem. This automatically compensates for thermal shrinkage and wear.

When a defective valve is suspected, follow this procedure to repair it. The tank must be empty.

1. Open the vent valve and release any pressure that is in the container.

2. Replace parts as needed and reassemble in reverse order.

Flow Meter Settings (Turbines Inc Flow Meter)

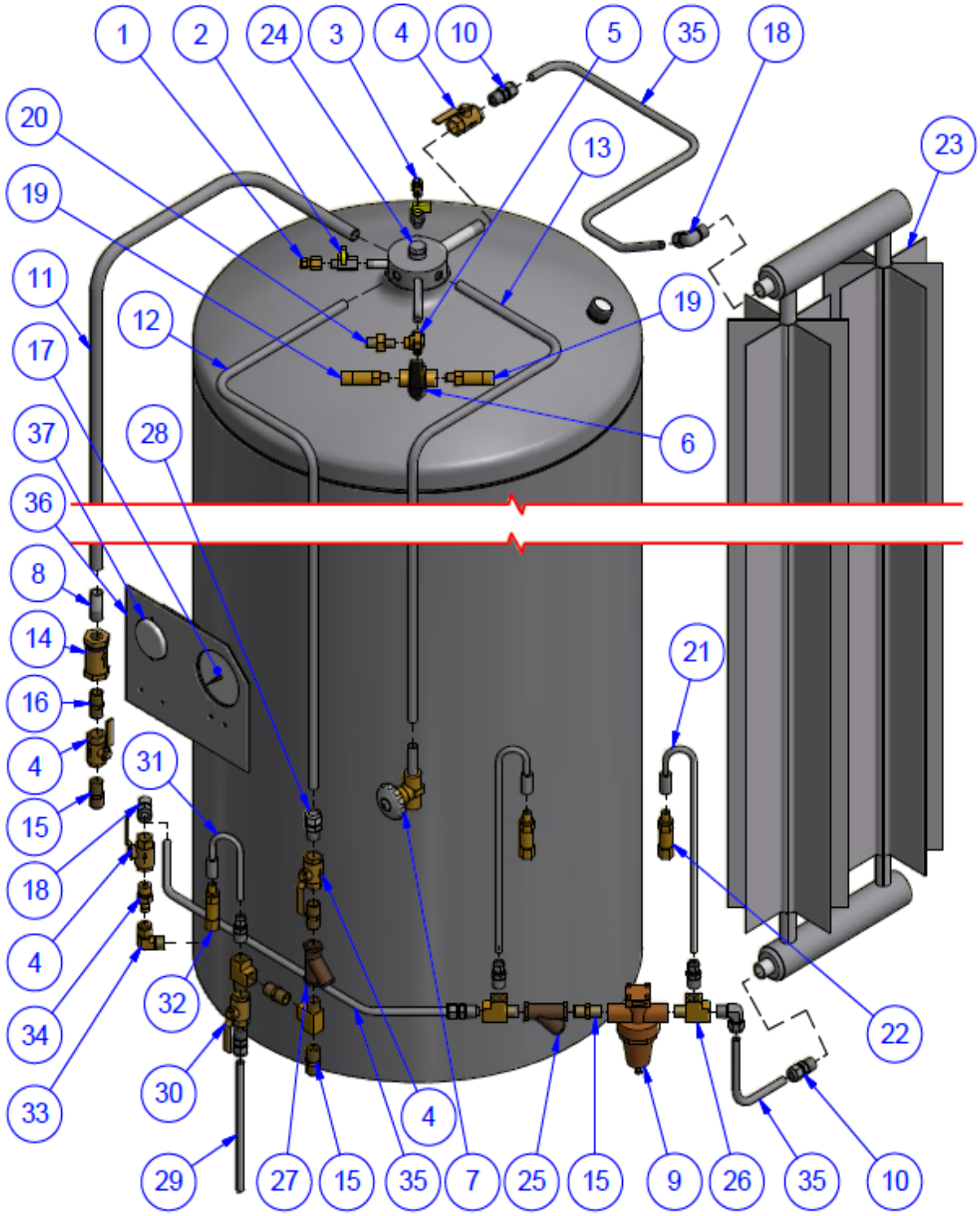
The Turbines Inc. flow meter is programmed and ready for use when the VLCD unit is shipped. If there is an issue with the settings of the meter, please refer to Appendix A. Appendix A displays step by step procedures of how the Turbines Inc flow meter should be set-up. If for any reason there are discrepancies, please correct the settings according to the procedures in Appendix A. Furthermore, if issues or problems persist, please contact Chart Customer Service. We will help you in every way we can.

Pallet Frame Damage

Please note that the pallet frame is made of carbon steel. The coating used is very durable and can withstand general usage applications. If for some reason the coating is removed and the steel of the frame can be seen, the steel can corrode. The area will need to be covered with a weather proof coating. The steel frame can be repainted by an individual, or a protective sleeve can be used. If the steel is exposed to moisture, over time, oxidation can occur.

SECTION 11 PARTS IDENTIFICATION

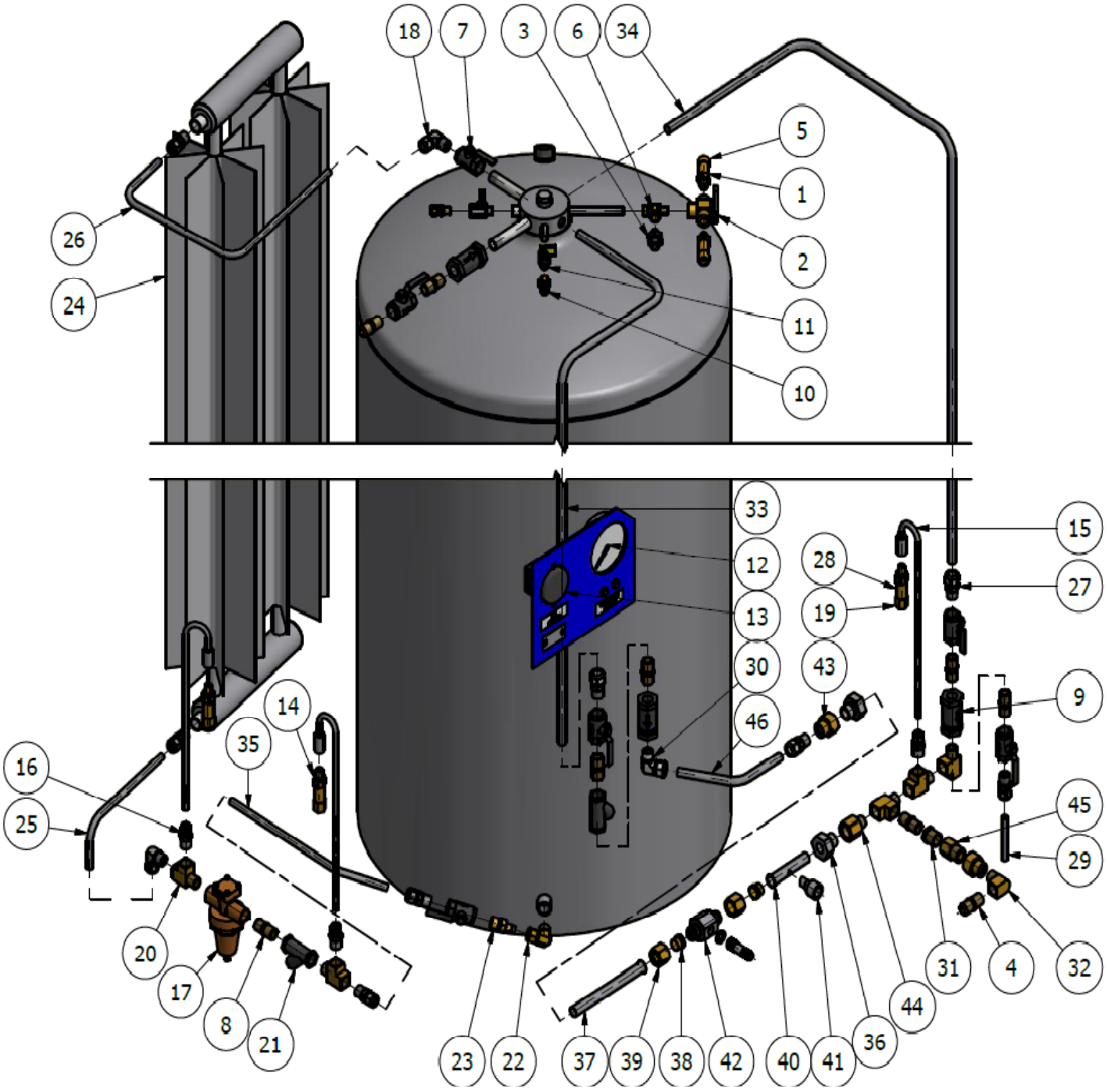
VLCD 950 Single Unit



Nomenclature (VLCD 950 Single Unit)

ITEM	QTY	CHART P/N	Description
1	1	11555458	CONN BRS 1/4ODT x 1/4FPT
2	2	20614745	ISOLATION VALVE BRS ITALY
3	1	11555440	CONN BRS 1/4ODT x 1/4MPT
4	4	12962291	VALVE BALL BRS 1/2FPT W/SS
5	1	14175021	TEE STREET BRS 1/4NPT
6	1	10694000	VALVE BRS 1/4" 3-WAY BALL
7	1	11905956	VALVE BRS SH 3/8FPTX3/8 SCH 10
8	1	1312361	NIPPLE TOE SS 1/2NPTX2 SCH 40
9	1	14838541	REGULATOR .500NPT @ 300 PSI
10	3	11357232	CONN SS 1/2ODTX1/2MPT
11	1	14228794	TUBE VLCD FILL TOP SINGLE
12	1	14228807	TUBE VLCD LIQUID SINGLE
13	1	14228815	TUBE VLCD VENT SINGLE
14	1	13620233	VALVE CHECK BRS 1/2FPTX1/2FPT
15	3	1110912	CONN BRS 5/8ODT x 1/2MPT 45D FL
16	3	1310102	NIPPLE HEX BRS 1/2NPT SCH 40
17	1	14932571	PG 4"DIAL 0-400PSI/BAR/KG/CM2
18	3	11357241	ELBOW SS 90D 1/2ODTX1/2MPT
19	2	11884788	RV BRS 1/4MPT 350 PSI
20	1	1911692	RPD ASSY INLINE W1/4"MPT X3/8 SAE FLARE @ 584PSI
21	2	13258211	TUBE RV S/A
22	2	1812702	RV BRS 1/4MPT 550 PSI
23	1	13756173	VAPORIZER ASSY VLCD1900 CRYO-
24	1	11811036	RETRO FIT PLUG (3/4" BOSS PLUG)
25	1	14845151	STRAINER 1/2"NPT
26	4	1212082	TEE STREEET 1/2"FPT x 1/2"MPT
27	1	14845151	STRAINER 1/2"NPT
28	2	11939558	CONN BRS 5/8ODT x 1/2MPT
29	1	2710201	TUBE SS .500"OD .049W WLD
30	1	1717692	VALVE BALL BRS 1/2FPT W/SS
31	1	11774431	RV TUBE S/A MPV
32	1	1811472	RV BRS 1/4MPT 450 PSI
33	1	14911315	ELBOW BRS 90D 1/2ODTX1/2MPT
34	1	13660497	ADAPTER BRS 1/2ODTX1/2MPT SL
35	3	2710201	TUBE SS .500"OD .049W WLD
36	1	14281077	BRACKET INSTR PANEL VLCD 950
37	1	13762485	DIFF PG 0- 45" 1/4"FPT PM

VLCD 950 w/ Flow Meter

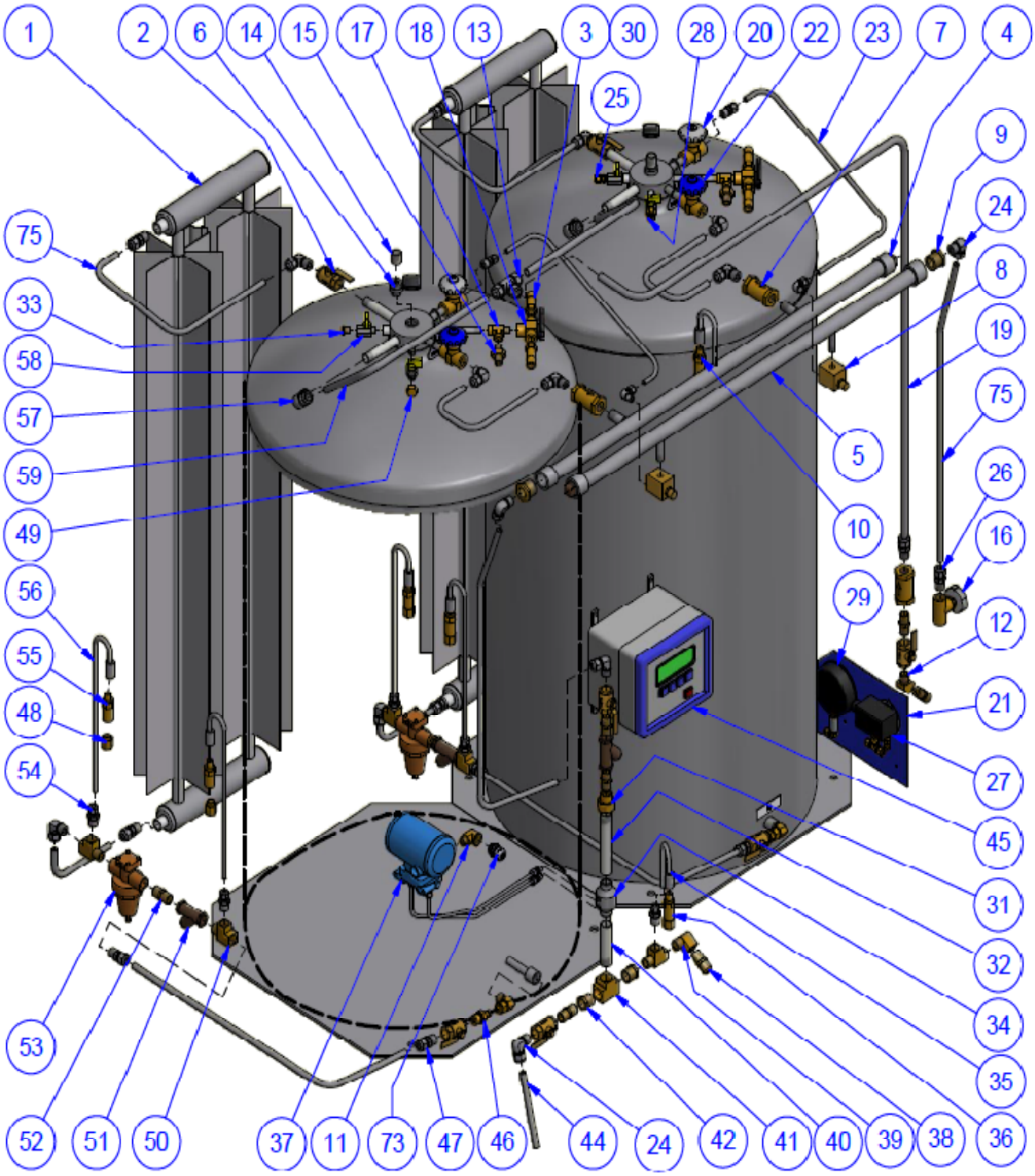


Nomenclature (VLCD 950 w/ Flow Meter)

ITEM	QTY	CHART P/N	DESCRIPTION
1	2	11884788	RV BRS 1/4MPT 350PSI
2	1	10694000	VALVE BRS 1/4" 3-WAY BALL MODIFIED
3	1	1911692	RPD ASSY INLINE W1/4MPT*3/8SAE FLARE 584PSI 316SS DISC
4	2	1110912	CONN BRS 5/8ODT*1/2MPT 45D FL
5	2	11086401	ADAPTER PIPE-AWAY 3/8FPT
6	1	14175021	TEE STREET BRS 1/4NPT
7	6	12962291	VALVE BALL BRS 1/2FPT W/SS TRIM W/DRAIN
8	7	1310102	NIPPLE HEX BRS 1/2NPT SCH 40
9	3	13620233	VALVE CHECK BRS 1/2FPT*1/2FPT
10	1	11555458	CONN BRS 1/4ODT*1/4FPT
11	2	20614745	VALVE ISOLATION BRS ITALY
12	1	10700596	PG 4"DIAL 0-400PSI/BAR/KG/CM2 1/4"NPT LM
13	1	13762485	DIFF PG 2-1/2" DIAL 0-80" H2O
14	2	1812702	RV BRS 1/4MPT 550PSI
15	3	13258211	RV TUBE S/A TRIFECTA-X
16	3	10MC008	CONN SS 3/8ODT*1/2MPT
17	1	11635511	REGULATOR .500NPT @ 450PSI
18	2	11357241	ELBOW SS 90D 1/2ODT*1/2MPT
19	3	1611592	ADAPTER PIPE-AWAY 3/8FPT
20	5	1212082	TEE STREET BRS 1/2FPTX1/2MPT
21	2	14845151	STRAINER .500NPT BRZ NO LEAD
22	1	10501968	ELBOW BRS 90D 1/2ODT*1/2MPT
23	1	13660497	ADAPTER BRS 1/2ODT*1/2MPT SL
24	2	13756173	VAPORIZER ASSY VLCD
25	1	2710201	TUBE SS .500"OD .049W WLD
26	1	2710201	TUBE SS .500"OD .049W WLD
27	3	11939558	CONN SS 5/8ODT*1/2MPT
28	1	1811472	RV BRS 1/4MPT 450PSI
29	1	2710201	TUBE SS .500"OD .049W WLD
30	1	11939566	ELBOW SS 90D 5/8ODT*1/2MPT SL
31	1	11392716	BSHG HEX BRS 3/4MPT*1/2FPT
32	1	1210502	ELBOW STREET BRS 90D 1/2NPT
33	1	20596456	TUBE VLCD LIQUID
34	1	20596457	TUBE VLCD VENT
35	1	2710201	TUBE SS .500"OD .049W WLD
36	2	900224	TURBINES INC UPSTREAM FITTING
37	1	900227	TURBINES INC UPSTREAM TUBE
38	2	900225	TURBINES INC UPSTREAM SLEEVE
39	2	900223	TURBINES INC TURBINE NUT

40	1	900228	TURBINES INC DOWNSTREAM TUBE
41	1	20548308	PIPE W/T-PROBE CPLR .75"
42	1	900143	TURBINES INCE TURBINE FLOW
43	2	11920689	RDCR BRS 3/4FPT*1/2FPT
44	1	10799987	ADAPTER BRS 3/4FPTX1/2MPT
45	1	20596997	VALVE FEMALE/MALE 3/4"NPT BRS
46	1	20601709	TUBE VLCD LIQ/DELIVERY

VLCD 1900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Nomenclature (VLCD 1900)

ITEM	QTY	CHART P/N	Description
1	2	13756173	VAPORIZER ASSY
2	7	12962291	VALVE BALL BRS 1/2" FPT
3	4	11884788	RV BRS 1/4"MPT 350 PSI
4	1	13764691	LIQUID MANIFOLD VLCD
5	1	13764704	VENT MANIFOLD VLCD
6	2	11764305	SUREFILL RETRO FIT PLUG
7	2	11051090	VALVE CHECK BRS 1/2FPTX1/2FPT
8	2	11208587	VALVE EXCESS FLOW CHECK 1/4
9	2	10821110	BSHG HEX BRS 1MPTX1/2FPT
10	1	1812702	RV BRS 1/4MPT 550PSI
11	1	1213192	ELBOW STREET BRS 90D 3/8NPT
12	1	1210492	ELBOW STREET BRS 45Deg 1/2"MPT
13	1	11939486	TEE SS UNION 5/8 ODT SL
14	2	1311461	NIPPLE TOE SS 1/2" NPT x 1" SCH 40
15	2	1911692	RPD ASSY INLINE 1/4"MPT
16	1	11555482	VALVE BRS SH 1/2FPTX1/2FPT
17	2	14175021	TEE STREET BRS 1/4"NPT
18	2	10694000	BALL VALVE BRS 1/4" 3-WAY
19	1	13818477	TUBE VLCD FILL FRONT
20	2	11905956	VALVE BRS SH 3/8"FPT x 3/8" SCH10
21	1	14641466	FRAME INSTRUMENT PANEL
22	2	11906043	VALVE BRS 3/8"FPT SCH 10 BLUE
23	2	2710131	TUBE SS .375"OD .035W WLD
24	12	11357241	ELBOW SS 90D 1/2ODTX1/2MPT
25	1	11555440	CONN BRS 1/4ODTX1/4MPT
26	7	11357232	CONN SS 1/2ODTX1/2MPT
27	1	13762485	DIFF PG 0- 45" 1/4"FPT PM
28	1	11555458	CONN BRS 1/4ODTX1/4FPT
29	1	14932571	PG 4"DIAL 0-400PSI/BAR/KG/CM2
30	4	11086401	ADAPTER PIPE-AWAY 3/8"FPT
31	1	11920689	RDCR BRS 3/4" FPT x 1/2"FPT
32	1	10790077	NIPPLE TOE SS 3/4"NPT x 6" SCH 40
33	1	1211102	PLUG BRS HEX HD .250MPT
34	1	10946406	METER
35	2	11774431	RV TUBE S/A MPV
36	1	1811472	RV BRS 1/4"MPT 450 PSI
37	1	10673778	TRANSMITTER DIFF PRESS
38	2	1110912	CONN BRS 5/8" x 1/2"MPT 45D FL

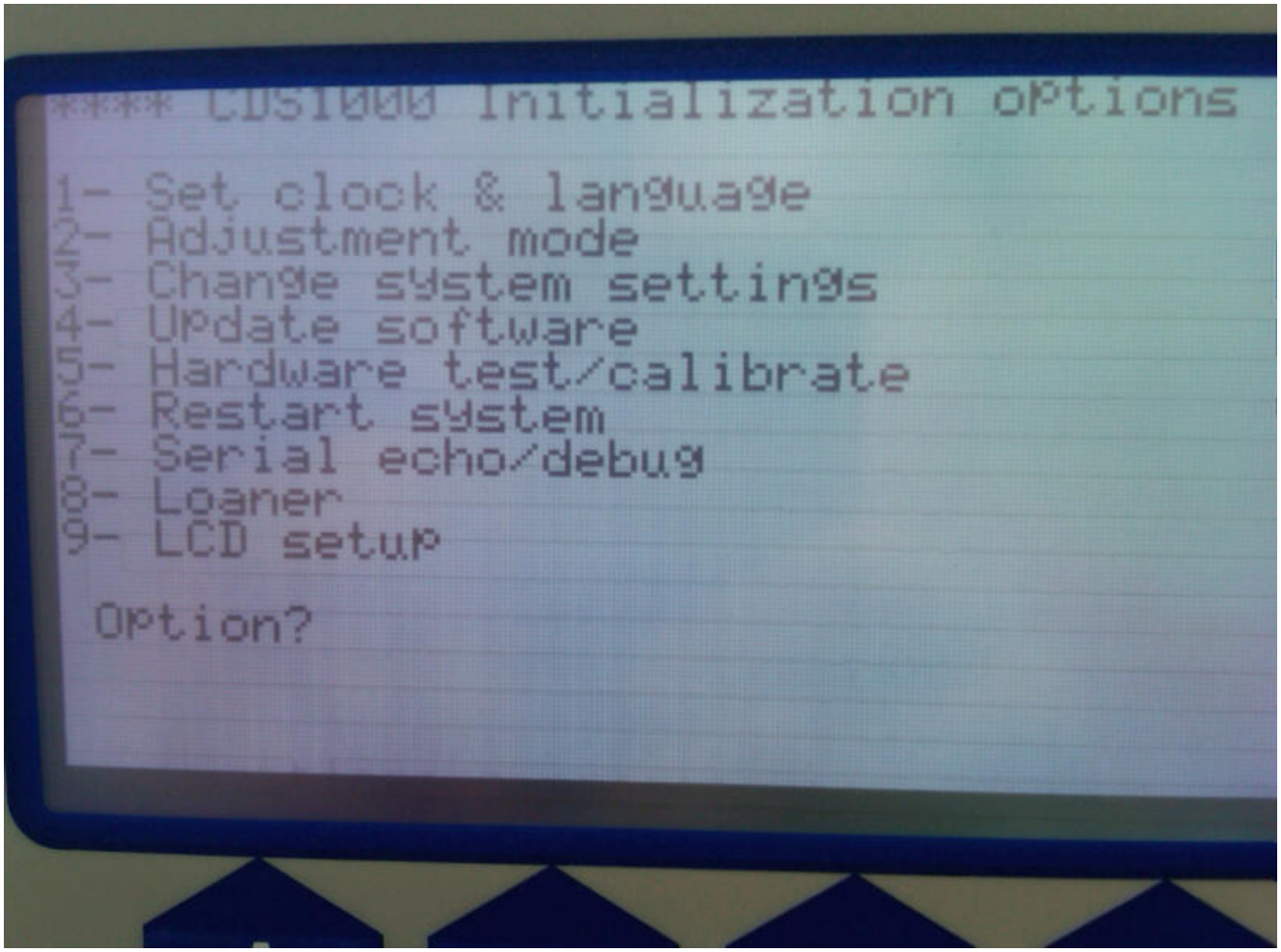
39	1	1210502	ELBOW STREET BRS 1/2NPT
40	1	132063	NIPPLE TOE SS 3/4"NPT x 3-15/16"
41	1	1212362	TEE BRS 3/4" FPT
42	2	11392716	BUSHING HEX BRS 3/4" MPT x 1/2"FPT
43	4	2952051	HHCS SS 1/4-20X2"LG
44	1	2710201	TUBE SS .500"OD .049W WLD
45	1	FL1122000	FC2000,justiert&parametriert
46	1	13660497	ADAPTER BRS 1/2"OD x 1/2"MPT
47	6	11357232	CONN SS 1/2ODTX1/2MPT
48	4	1611592	RV BRS INLINE ADAPTER 3/8"NPT
49	1	1210752	CAP BRS HEX 1/4FPT
50	5	1212082	TEE STREET 1/2"FPT x 1/2"MPT
51	3	14845151	STRAINER .500NPT
52	5	1310102	NIPPLE HEX 1/2"NPT SCH 40
53	2	11635511	REGULATOR .500NPT 450PSI
54	5	10MC008	CONN SS 3/8"OD x 1/2"MPT
55	4	1812702	RV BRS 1/4"MPT 550PSI
56	4	13258211	RV TUBE S/A TRIFECTA
57	2	12991972	ELBOW SS 90D 5/8"OD x 1/2"FPT
58	4	20614745	VALVE ISOLATION BRS ITALY
59	2	11939507	TUBE PB CIRCUIT LEFT

APPENDIX A **FLOW METER SET-UP**

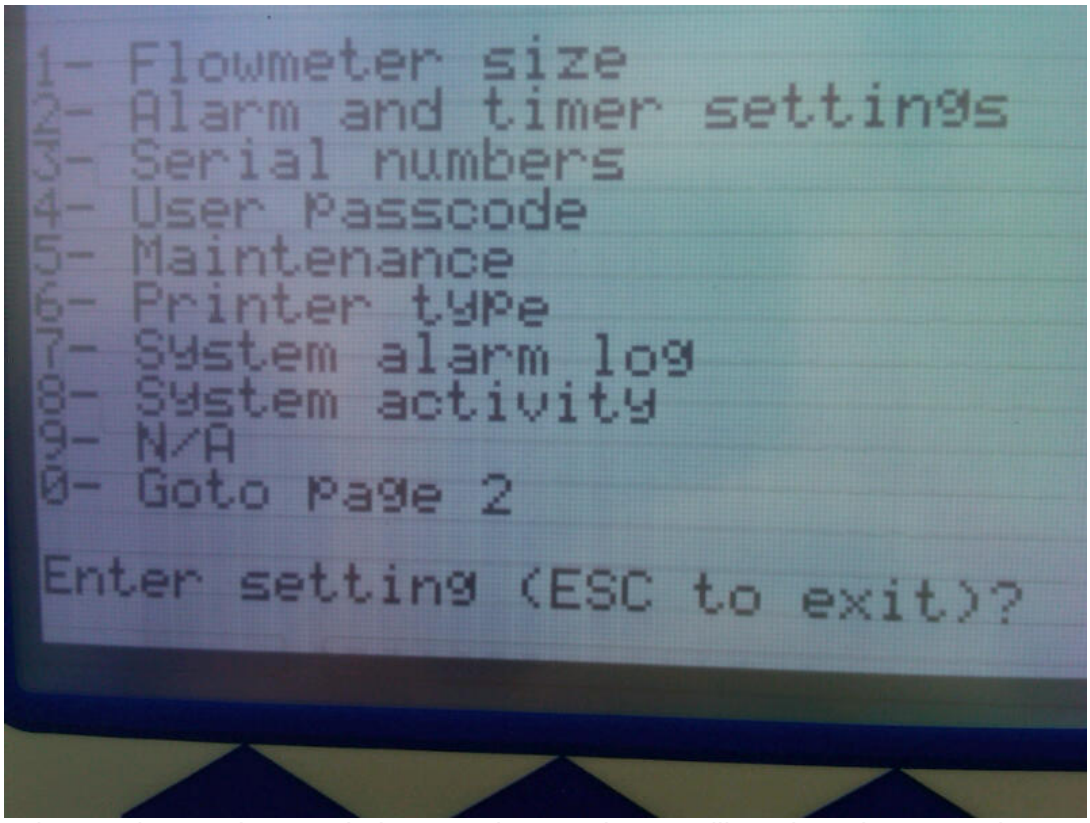
VLCD 950 Operation and Calibration Preparation

Before operating or attempting to calibrate the VLCD 950, a few changes need to be made to the CDS 1000 Flow Meter Monitor (referred to as the CDS 1000). Instructions will follow along with pictures to reference.

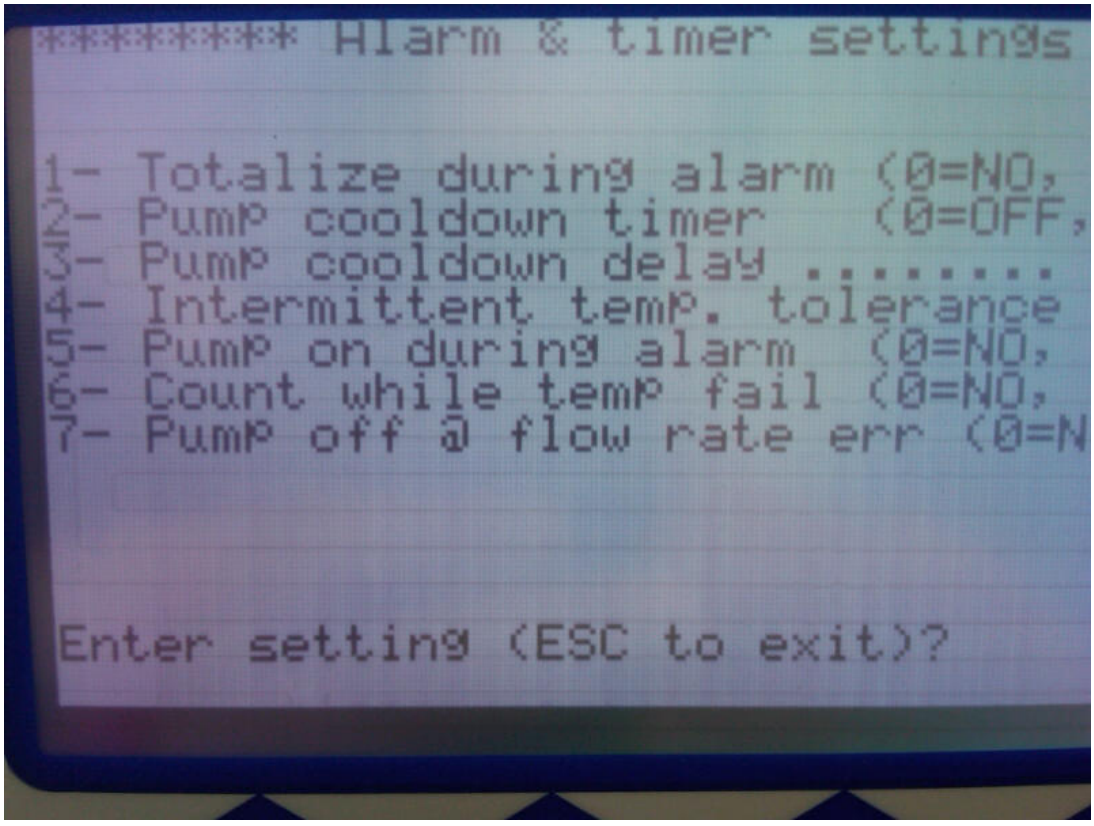
1. While the CDS 1000 is off, hold the ESC button down for 2 full seconds and press the On/OFF button while still holding the ESC button.
2. This action should produce the screen shown below.
3. Select option 3- Change System Settings



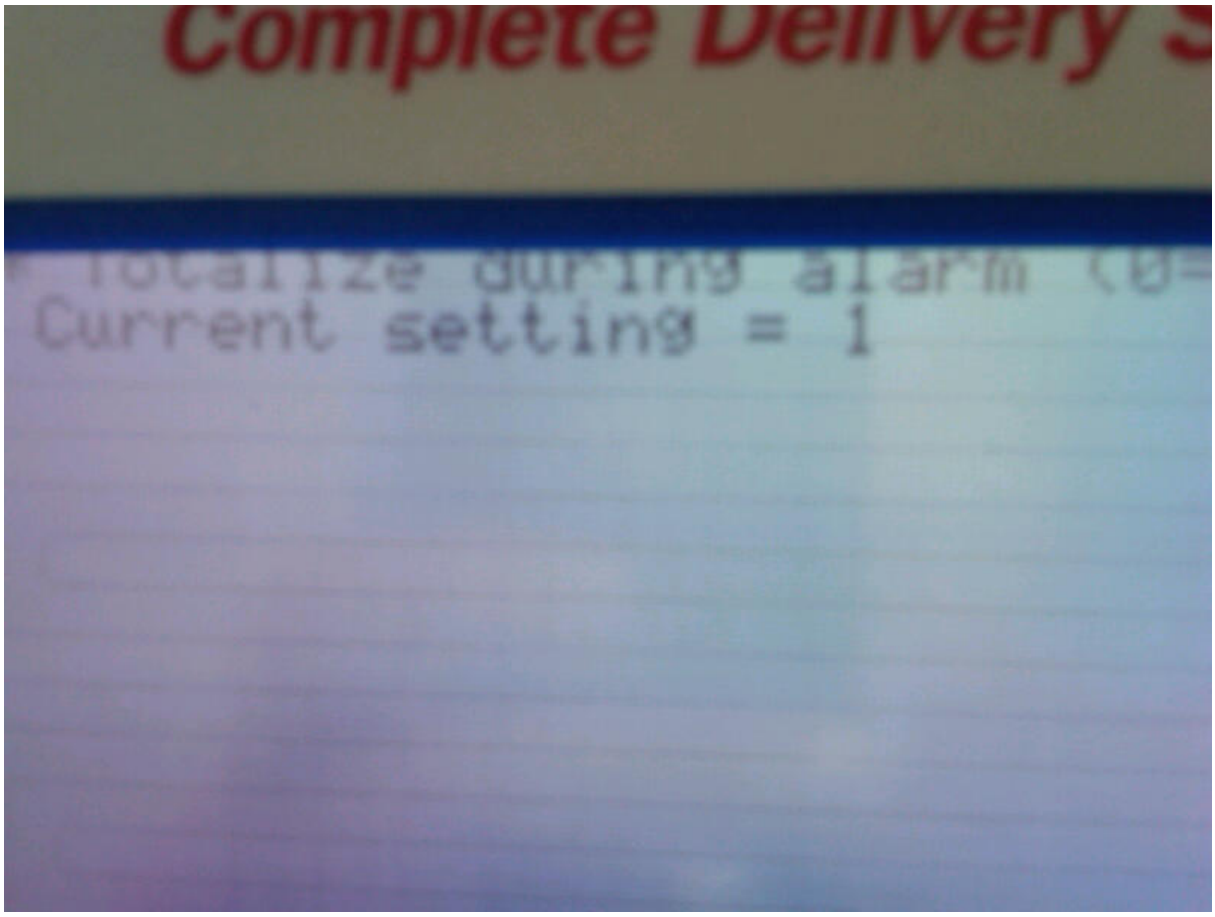
4. Choosing the 3rd option should produce the Menu shown below.



Select Option 2- Alarm and Timer Settings. Doing so will produce the menu shown elow.

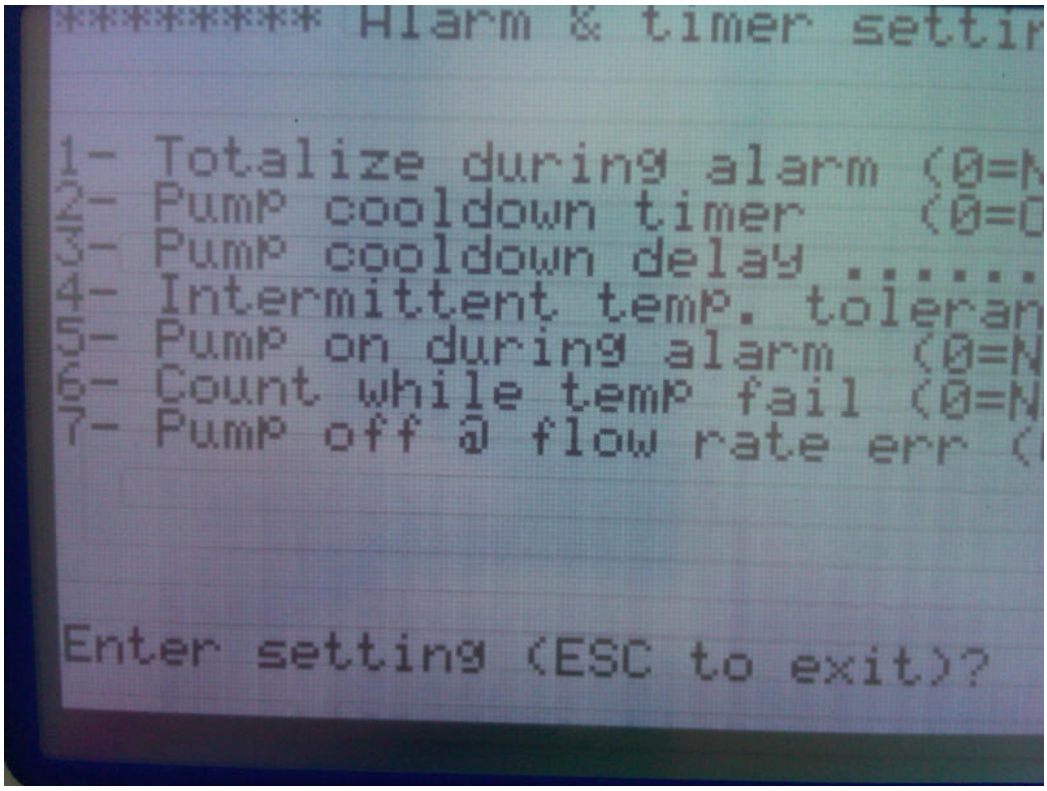


5. The above menu is where all of the changes need to be made, starting with Option 1- Totalize During alarm. Selecting this option will produce the menu below.

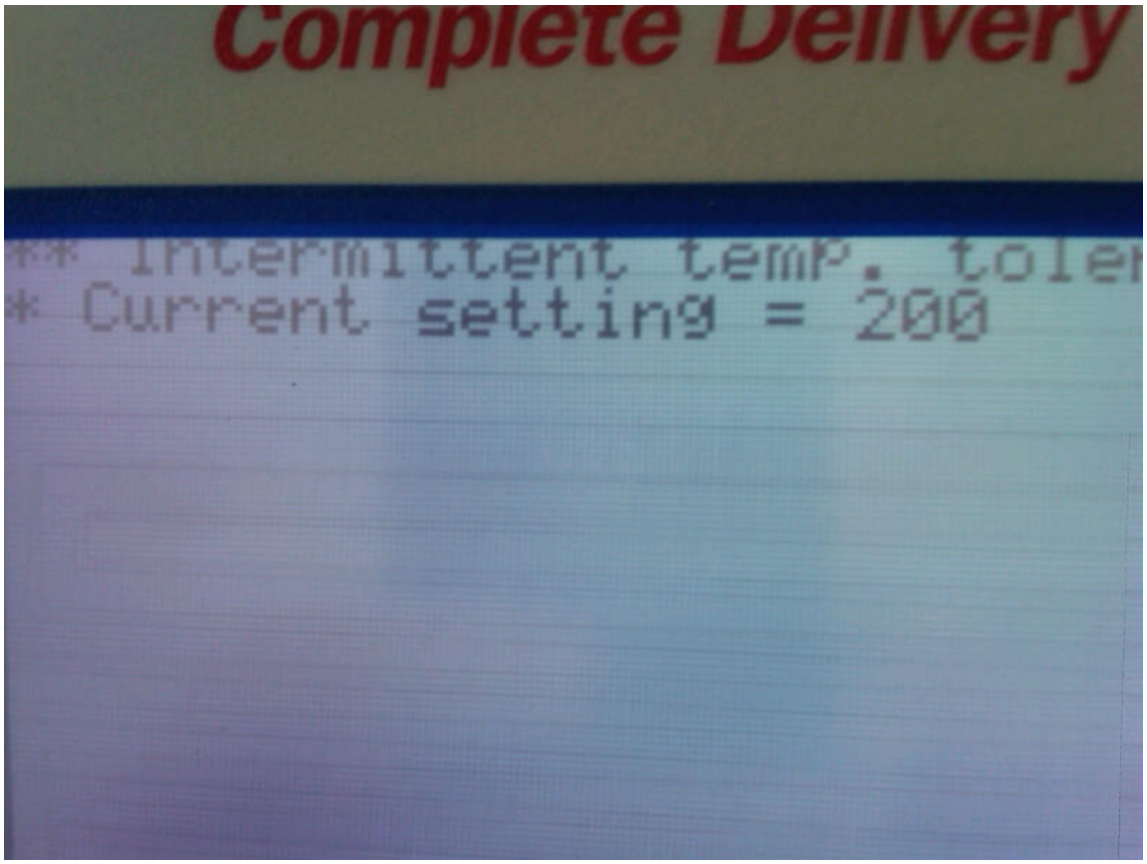


6. In the event of an alarm while product is flowing, the CDS 1000 is set-up to stop totalizing. Changing the setting to a "1", shown above, will allow the CDS 1000 to continue counting the amount of product that is pumped from the VLCD even if an alarm has occurred.

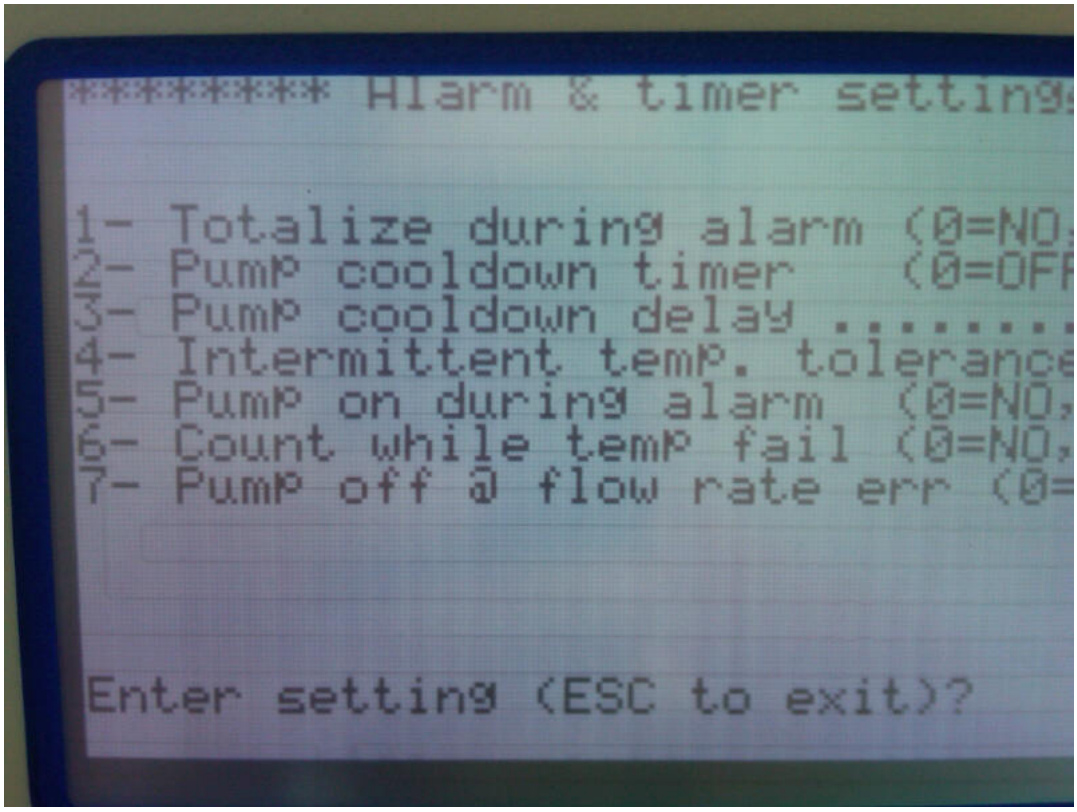
7. After changing the setting to "1", return to the menu below.



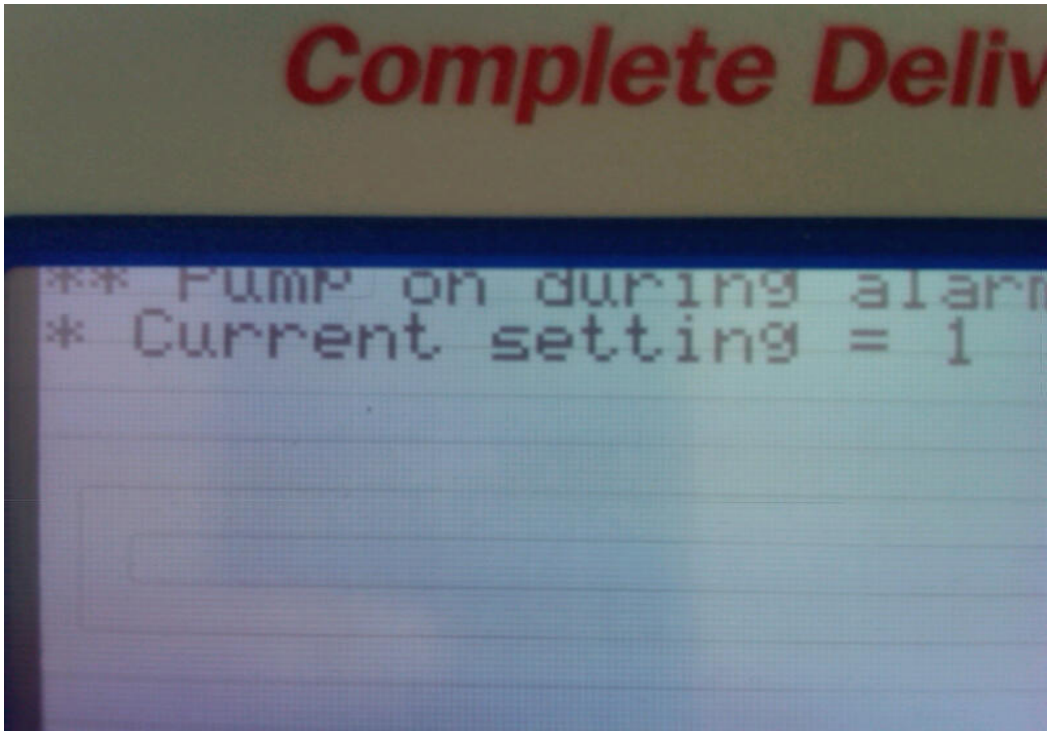
8. Selecting Option 4- Intermittent Temp. Tolerance will produce the menu below.



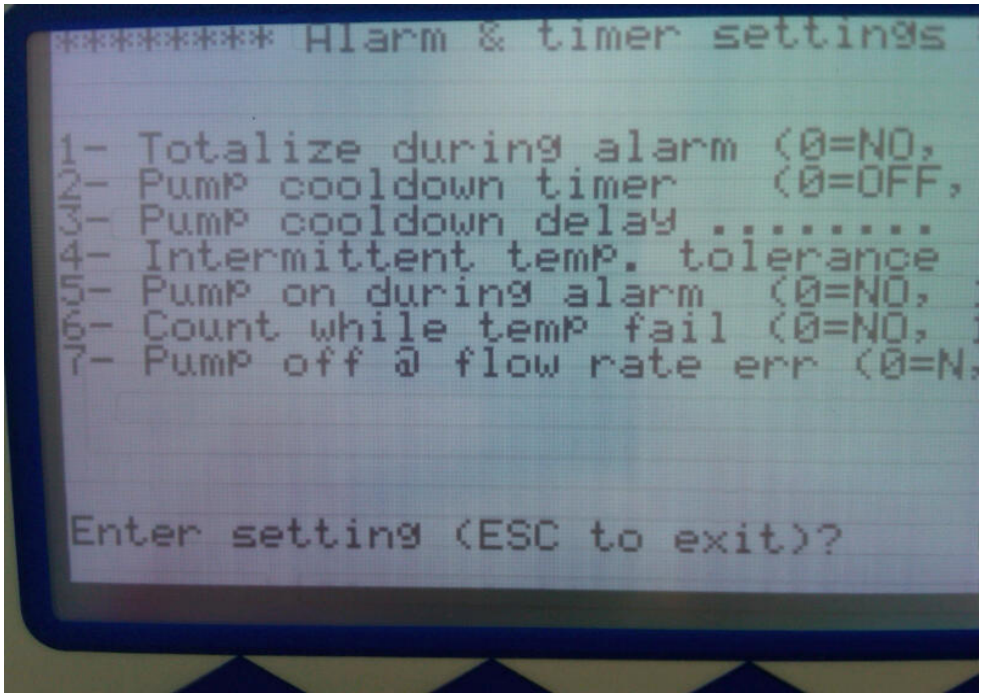
9. Change the setting above to 200, which is a value in seconds. After doing so, return to the menu shown below.



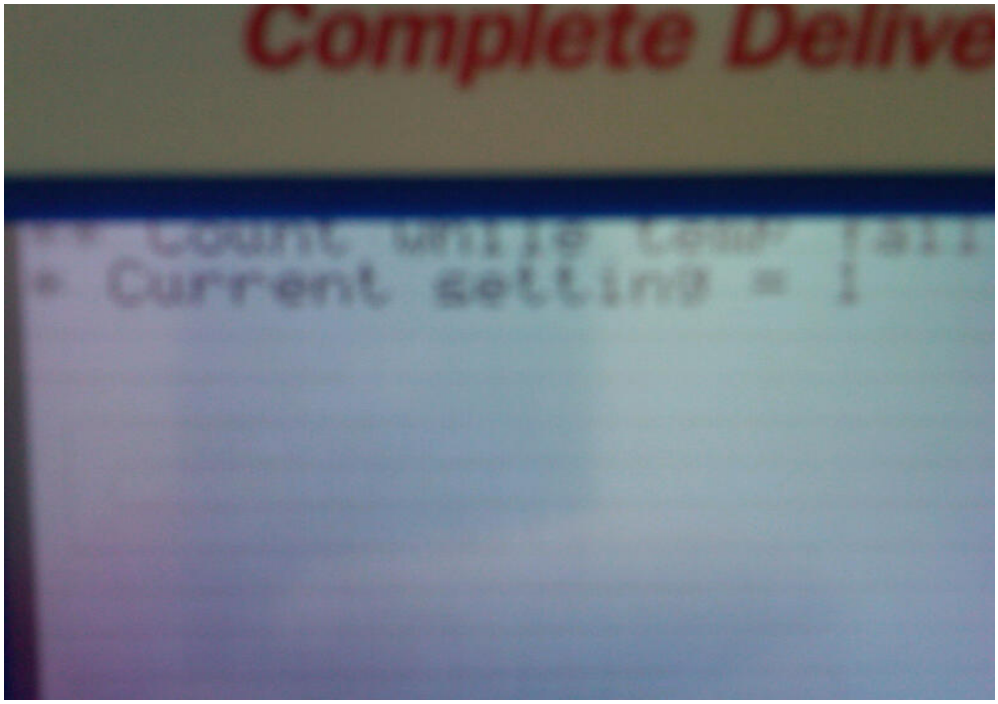
10. From this menu above, select Option 5- Pump On During Alarm. Selecting option 5 will produce the menu shown below.



11. The CDS 1000 is set-up with a "0" as the current setting. This will cause the pump to stop in the event of an alarm. Change the setting to "1". Doing so will allow the pump to continue to move product. After changing the setting, return to the menu below.

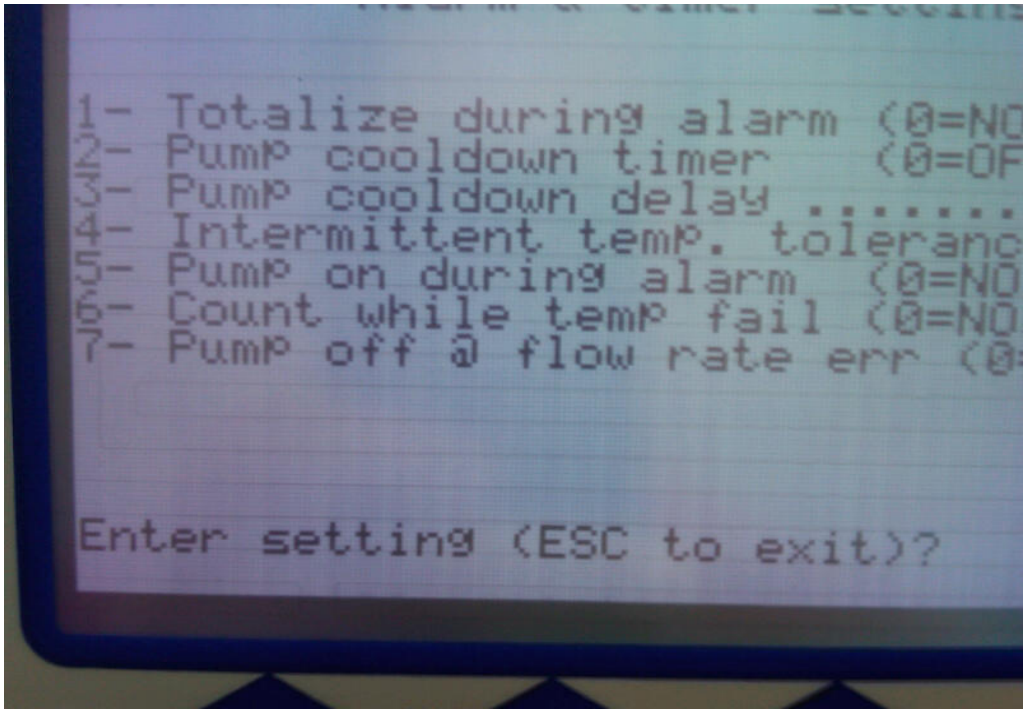


12. Select Option 6- Count while Temp Fail. Making this selection will produce the menu shown below.

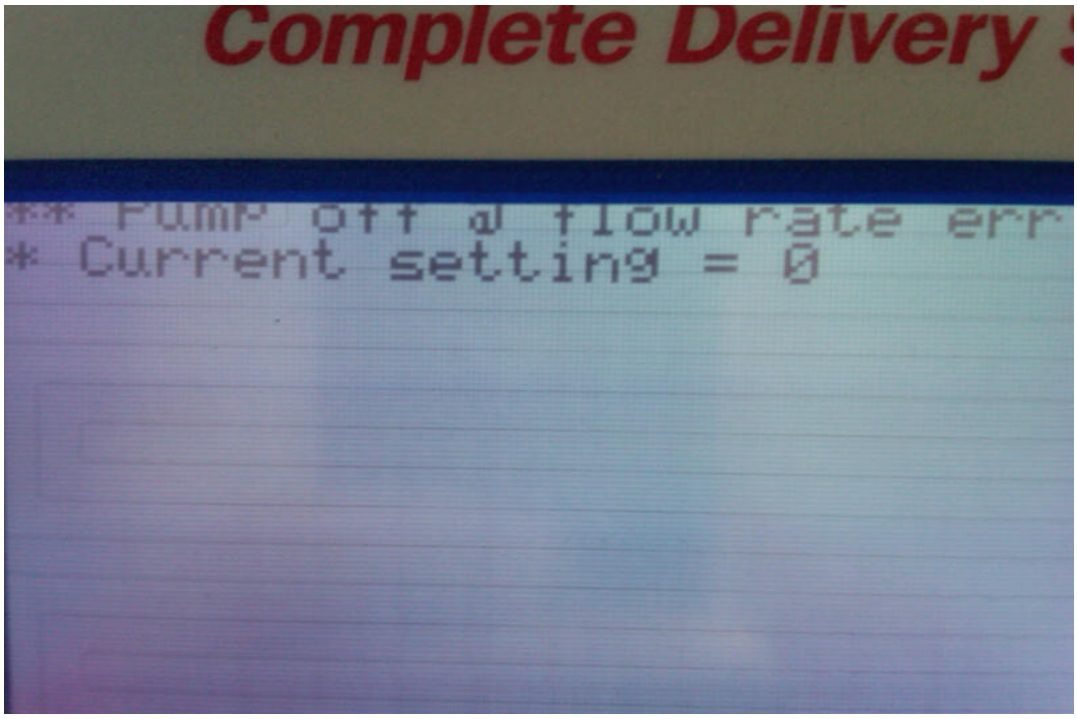


13. Change the Current Setting to "1". This will allow the count to continue even during a low temp alarm, which occurs every time product is being pumped from the VLCD.

14. Contact may need to be made about the temperature range for CO_2 in the CDS 1000. Turbines is responsible for this setting. The temperature range should be between -109F and 10F.
15. After changing the current setting in the Count While Temp Fail menu, retunr to teh manu shown below.



16. From this menu, select Option 7- Pump Off @ Flow Rate Err. Doing so will result in the menu below.



17. Change the Current Setting to "0". This will prevent the pump from shutting off in the event of a Flow Rate Error.
18. After the setting has been changed, press Esc twice to return to the Home Screen.
19. Turn the unit off, and then back on. The CDS 100 is ready for operation or calibration.