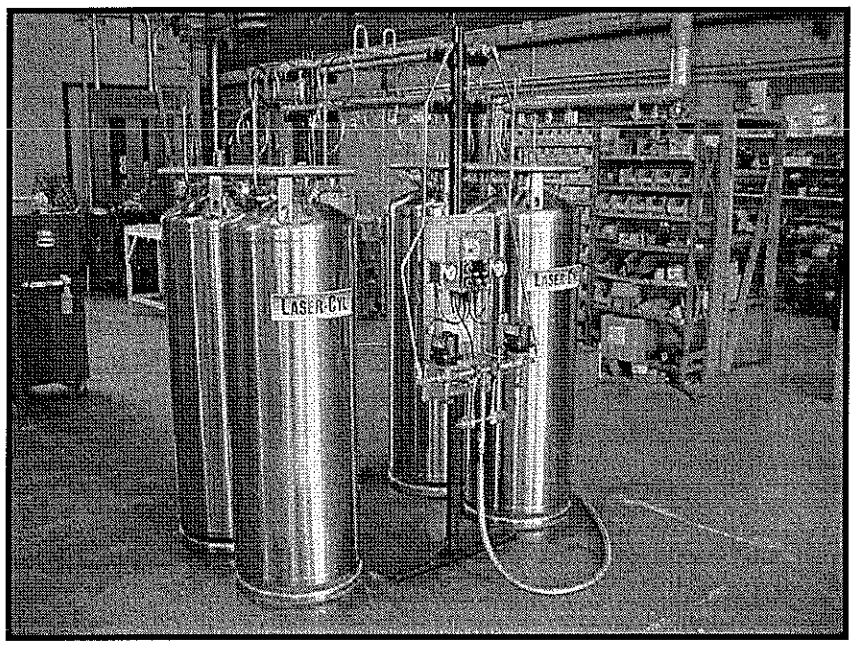
Laser-Tec
Liquid Cylinder Manifold

PATENT APPLIED FOR



MANUAL #11384661

CHART STORAGE SYSTEMS DIVISION
DIVISION OF CHART INDUSTRIES
1.800.400.4683

GENERAL

Congratulations, you now own Chart Industries, Inc.'s Laser-Tec Liquid Cylinder Manifold high-pressure gas supply system. The Laser-Tec is designed to utilize standard, liquid cylinders to produce the high pressure and high flow rate gas that is being demanded by today's industrial lasers. Designed to provide a continuous flow of high pressure, high flow gas, the Laser-Tec delivers without interruptions.

The Laser-Tec Liquid Cylinder Manifold was developed to eliminate problems that typically occur when manifolding cryogenic liquid cylinders together to obtain greater flow rates. The manifold system uses two banks of liquid cylinders, one in operation and the other on reserve, to assure uninterrupted flow, and is designed to allow for expansion, depending on your gas needs. Simply attach more cylinders as your flow requirement changes. Your flow requirements and use patterns will determine the number of cylinders on each bank.

The piping and control logic assure that the gas supply is uninterrupted and the tanks have essentially no residual liquid when the cylinders are replaced. The controls can communicate with optional telemetry for seamless ordering.

SYSTEM SPECIFICATIONS

FLOW

The Laser-Tec Liquid Cylinder Manifold is capable of supplying a continuous gas flow at flow rates and pressures that simple cylinder manifolds can't. Use the following curves to select the number of cylinders needed for your flow requirements.

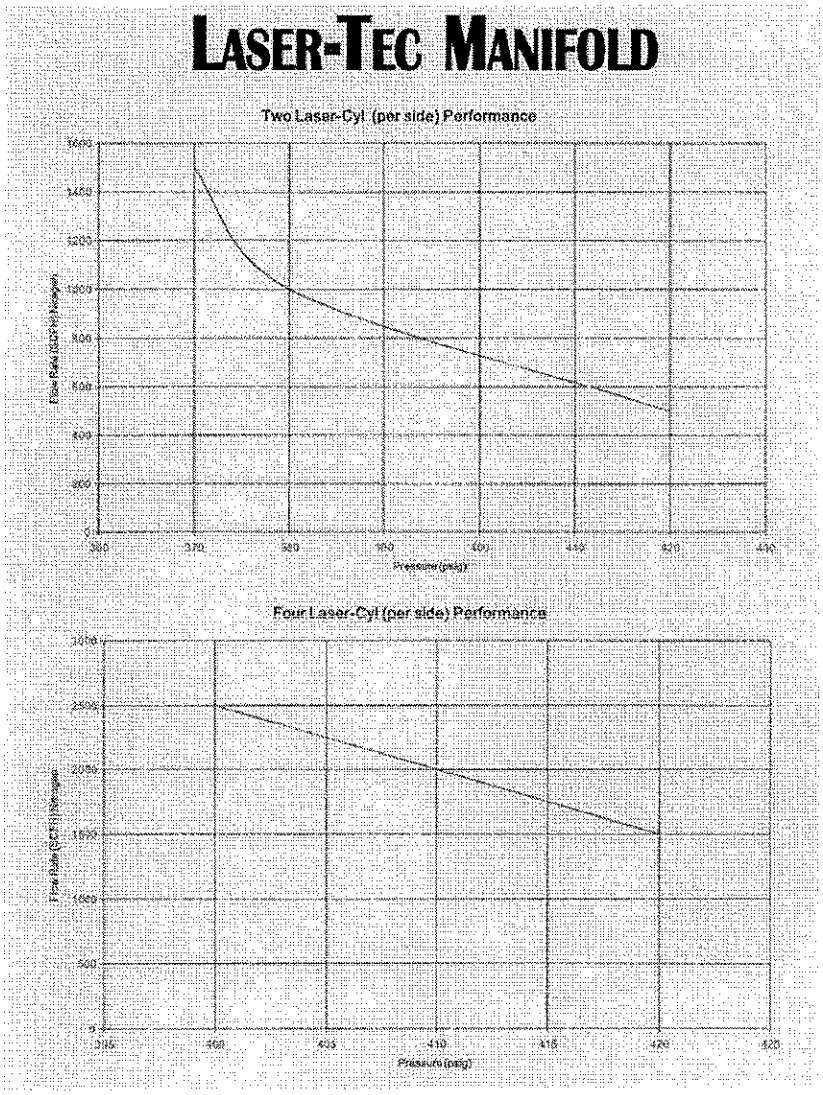


Figure 1 - System Flow Curves

ELECTRICAL

The system has an electrical requirement of 6A that breaks down as follows:

(2) Solenoid valves @ 2.5A each = 5A[1]

Controls @1A

The electrical supply voltage should be 110 Vac

[1] The solenoid valves have a 2 5 Amp peak load, 1 Amp continuous load.

WARRANTY AND SERVICE STATEMENTS

STANDARD WARRANTY

WORKMANSHIP AND VACUUM

Chart, Inc. warrants all Manifold Systems we manufacture to be free from defects in material and workmanship for **ONE YEAR** after shipment, subject to the exclusions listed below and statements on the following pages.

If a warranty repair is required, the Manifold System will be repaired at the nearest Chart Authorized Service Center.

EXCLUSIONS

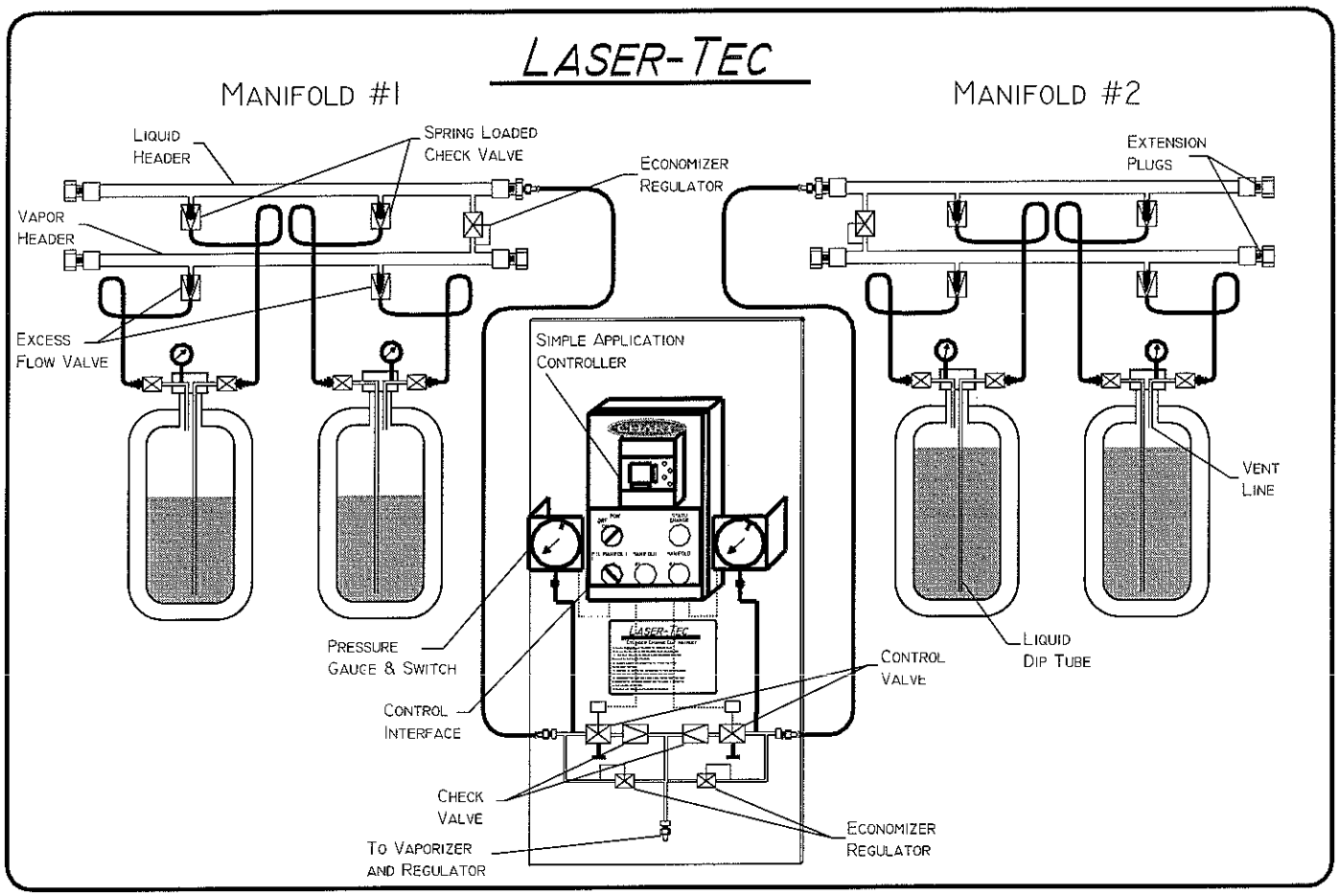
A.) We accept no liability for any warranty work performed or costs incurred by the customer, or others, without Chart Inc.'s express prior written approval.

B.) Chart Inc.'s obligations under this warranty is expressly limited to repair or replacement of any part or workmanship that Chart manufactured and found to be defective within **ONE YEAR** after ship date.

C.) Chart Inc., is not liable for any other losses, damages, product losses, cost of delays, freight charges, or excess costs for repairs made outside the 48 adjacent United States, including incidental or consequential damages.

D.) For warranty claims please call Chart Inc.'s Customer Service at 800-400-4683

TERMINOLOGY



LASER-TEC

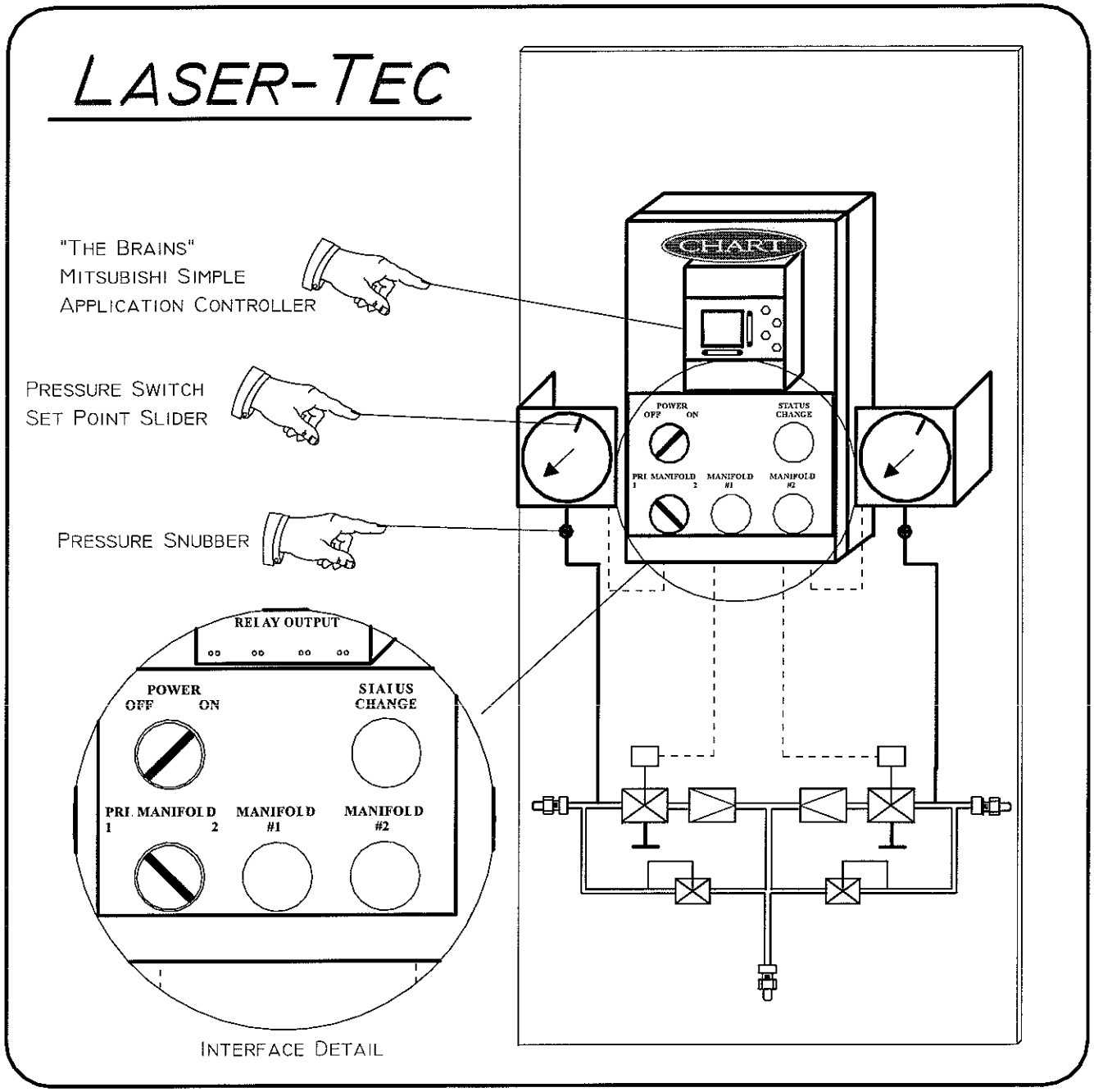


CHART STORAGE SYSTEMS DIVISION
DIVISION OF CHART INDUSTRIES
1 800 400 4683

SAFETY

As with any cryogenic system, it should be observed that any non-insulated piping can get extremely cold and should not be touched by exposed skin If the system requires maintenance, it should be shut-down and allowed to warm-up

If any maintenance is to be done on the system, such as changing valve seats, it is extremely important that the pressure be relieved from the system through the manual vent valves. The system pressures and liquid levels can be monitored by the five transmitters.

It is also recommended that when doing maintenance on the system that the manual isolation valves to the bulk tank are closed

SAFETY SUMMARY

Strict compliance with proper safety and handling practices is necessary when using a cryogenic system. 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 unit and safe operations are anticipated, it is essential that the user of the cryogenic system carefully read to fully understand all WARNINGS and CAUTION notes listed in this safety summary and enumerated below. Also read the information provided in the Safety Bulletin for Oxygen and Inert Gases following this Safety Summary. Periodic review of the Safety Summary is recommended.

In an oxygen enriched atmosphere, flammable items burn vigorously and could explode. Excess accumulation of oxygen creates an oxygen enriched atmosphere (defined by the Compressed Gas Association as an oxygen concentration above 23%) Certain items considered non-combustible in air may burn rapidly in such an environment. Keep all organic materials and other flammable substances away from possible contact with oxygen; particularly oil, grease, kerosene, cloth, wood, paint, tar, coal, dust, and dirt which may contain oil or grease Do not permit smoking or open flame in any area where oxygen is stored, handled, or used Failure to comply with this warning may result in serious personal injury.

Nitrogen and argon vapors in air may dilute the concentration of oxygen necessary to support or sustain life. Exposure to such an oxygen deficient atmosphere can lead to unconsciousness and serious injury, including death

Before removing any parts or loosening fittings, empty a cryogenic container of liquid contents and release any 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 due to the extreme cold and pressure in the tank.

Accidental contact of liquid gases with skin or eyes may cause a freezing injury similar to a burn. Handle liquid so that it will not splash or spill. Protect your eyes and cover skin where the possibility of contact with liquid, cold pipes and cold equipment, or cold gas exists Safety goggles or a face shield should be worn if liquid ejection or splashing may occur or cold gas may issue forcefully from equipment. Clean, insulated gloves that can easily be removed and long sleeves are recommended for arm protection Cuffless trousers should be worn over the shoes to shed spilled liquid.

If clothing should be splashed with liquid oxygen it will become highly flammable and easily ignited while concentrated oxygen remains. Such clothing must be aired out immediately, removing the clothing if possible, and should not be considered safe for at least 30 minutes

Use only replacement parts that are compatible with liquid oxygen and have 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 container

Before locating oxygen equipment, become familiar with the National Fire Protection Association (NFPA) standard No. 50, "Bulk Oxygen Systems at Customer Sites", and with all local safety codes. The NFPA standard covers general principles recommended for installing bulk oxygen systems on industrial and institutional consumer premises.

SAFETY BULLETIN

Portions of the following information is extracted from Safety Bulletin SB-2 from the Compressed Gas Association, Inc. (CGA). Additional information on nitrogen and argon and liquid cylinders is available in CGA Pamphlet P-9. Write to the Compressed Gas Association, Inc , 1235 Jefferson Davis Highway, Arlington, VA 22202

From CGA Safety Bulletin

Cryogenic containers, stationary or portable, are from time-to-time subjected to assorted environmental conditions of an unforeseen nature. This safety bulletin is intended to call attention to the fact that whenever a cryogenic container is involved in any incident whereby the container or its safety devices are damaged, good safety practices must be followed. The same holds true whenever the integrity or function of a container is suspected of abnormal operation.

Good safety practices dictate that the contents of a damaged or suspect container be carefully emptied as soon as possible Under no circumstances should a damaged container be left with product in it for an extended period of time. Further, a damaged or suspect container should not be refilled unless the unit has been repaired and recertified.

Incidents which require that such practices be followed include: highway accidents, immersion in water, exposure to extreme heat or fire, and exposure to most adverse weather conditions (earthquakes, tornadoes, etc.). As a rule of thumb, whenever a container is suspected of abnormal operation, or has sustained actual damage, good safety practices must be followed.

In the event of known or suspected container vacuum problems (even if an extraordinary circumstance such as those noted above has not occurred), do not continue to use the unit. Continued use of a cryogenic container that has a vacuum problem can lead to embrittlement and cracking. Further, the carbon steel jacket could possibly rupture if the unit is exposed to inordinate stress conditions caused by an internal liquid leak.

Prior to reusing a damaged container, the unit must be tested, evaluated, and repaired as necessary. It is highly recommended that any damaged container be returned to CHART for repair and recertification

The remainder of this safety bulletin addresses those adverse environments that may be encountered when a cryogenic container has been severely damaged. These are oxygen deficient atmospheres, oxygen enriched atmospheres, and exposure to inert gases

OXYGEN DEFICIENT ATMOSPHERES

The normal oxygen content of air is approximately 21%. Depletion of oxygen content in air, either by combustion or by displacement with inert gas, is a potential hazard and users should exercise suitable precautions.

One aspect of this possible hazard is the response of humans when exposed to an atmosphere containing only 8 to 12% oxygen. In this environment, unconsciousness can be immediate with virtually no warning

When the oxygen content of air is reduced to about 15 or 16%, the flame of ordinary combustible materials, including those commonly used as fuel for heat or light, may be extinguished. Somewhat below this concentration, an individual breathing the air is mentally incapable of diagnosing the situation because the onset of symptoms such as sleepiness, fatigue, lassitude, loss of coordination, errors in judgment and confusion can be masked by a state of "euphoria," leaving the victim with a false sense of security and well being.

Human exposure to atmosphere containing 12% or less oxygen leads to rapid unconsciousness Unconsciousness can occur so rapidly that the user is rendered essentially helpless. This can occur if the condition is reached by immediate change of environment, or through the gradual depletion of oxygen.

Most individuals working in or around oxygen deficient atmospheres rely on the "buddy system" for protection - obviously, the "buddy" is equally susceptible to asphyxiation if he or she enters the area to assist an unconscious partner unless equipped with a portable air supply. Best protection is obtainable by equipping all individuals with a portable supply of respirable air. Life lines are acceptable only if the area is essentially free of obstructions and individuals can assist one another without constraint.

If oxygen deficient atmosphere is suspected or known to exist:

1. Use the "buddy system " Use more than one "buddy" if necessary to move a fellow worker in an emergency.
2. Both the worker and "buddy" should be equipped with self-contained or air line breathing equipment.

OXYGEN ENRICHED ATMOSPHERES

An oxygen enriched atmosphere occurs whenever the normal oxygen content of air is allowed to rise above 23% While oxygen is non-flammable, ignition of combustible materials can occur more readily in an oxygen-rich atmosphere than in air; and combustion proceeds at a faster rate although no more total heat is released.

It is important to locate an oxygen system in a well-ventilated location since oxygen-rich atmospheres may collect temporarily in confined areas during the functioning of a safety relief device or leakage from the system

Oxygen system components, including but not limited to, containers, valves, valve seats, lubricants, fittings, gaskets and interconnecting equipment including hoses, shall have adequate compatibility with oxygen under the conditions of temperature and pressure to which the components may be exposed in the containment and use of oxygen Easily ignitable materials shall be avoided unless they are parts of equipment or systems that are approved, listed, or proved suitable by tests or by past experience.

Compatibility involves both combustibility and ease of ignition. Materials that burn in air may burn

violently in pure oxygen at normal pressure, and explosively in pressurized oxygen. In addition, many materials that do not burn in air may do so in pure oxygen, particularly when under pressure. Metals for containers and piping must be carefully selected, depending on service conditions. The various steels are acceptable for many applications, but some service conditions may call for other materials (usually copper or its alloys) because of their greater resistance to ignition and lower rate of combustion.

Similarly, materials that can be ignited in air have lower ignition energies in oxygen. Many such materials may be ignited by friction at a valve seat or stem packing, or by adiabatic compression produced when oxygen at high pressure is rapidly introduced into a system initially at low pressure

NITROGEN AND ARGON

Nitrogen and argon (inert gases) are simple asphyxiants. Neither gas will support or sustain life and can produce immediate hazardous conditions through the displacement of oxygen. Under high pressure these gases may produce narcosis even though an adequate oxygen supply, sufficient for life, is present.

Nitrogen and argon vapors in air dilute the concentration of oxygen necessary to support or sustain life. Inhalation of high concentrations of these gases can cause anoxia, resulting in dizziness, nausea, vomiting, or unconsciousness and possibly death. Individuals should be prohibited from entering areas where the oxygen content is below 19% unless equipped with a self-contained breathing apparatus. Unconsciousness and death may occur with virtually no warning if the oxygen concentration is below approximately 8%. Contact with cold nitrogen or argon gas or liquid can cause cryogenic (extreme low temperature) burns and freeze body tissue.

Persons suffering from lack of oxygen should be immediately moved to areas with normal atmospheres. SELF CONTAINED BREATHING APPARATUS MAY BE REQUIRED TO PREVENT ASPHYXIATION OF RESCUE WORKERS. Assisted respiration and supplemental oxygen should be given if the victim is not breathing. If cryogenic liquid or cold boil-off gas contacts a worker's skin or eyes, the affected tissues should be promptly flooded or soaked with tepid water (105-115°F; 41-46°C). DO NOT USE HOT WATER. Cryogenic burns which result in blistering or deeper tissue freezing should be examined promptly by a physician.

CHART Cryogenic Storage Systems are safely designed with the following features:

1. A vacuum maintenance system specifically designed to provide long life and all possible safety provisions.

2. Safety relief devices to protect the pressure vessel and vacuum casing, sized and selected in accordance with ASME standards to include a dual relief valve and rupture disc system to protect the pressure vessel, and a reverse buckling rupture disc or lift plate to protect the vacuum casing from over-pressure. While CHART equipment is designed and built to the most rigid standards, no piece of mechanical equipment can ever be 100% foolproof.

INSTALLATION

The Laser-Tec Liquid Cylinder manifold can be configured as a stand-alone floor mount design, or mounted on a wall. The modular channel frame components make the system easily convertible to whatever site installation situation arises.

Typical wall mounting installations are configured with the switchover module mounted to the wall, close enough to attach flexible stainless steel cryogenic hoses (rated at the appropriate pressure). The header modules can be mounted on both sides of the switchover module, at a height of approximately 72 inches from the floor. Use an appropriate wall anchor method, depending upon the substrate the wall is made of – make sure the wall anchors can support the weight of the manifold components.

Ample room should be given to exchange the empty liquid cylinders. Be sure there is proper ventilation and adequate safety precautions are taken (see safety section in this manual).

Out of the Box

The manifold is shipped assembled as a floor mount. The installer simple needs to install the ¼" vent tubes and the 3/8" liquid tubes. Included are: Four liquid lines, four vent lines, header and switch over assemble, and the manuals.

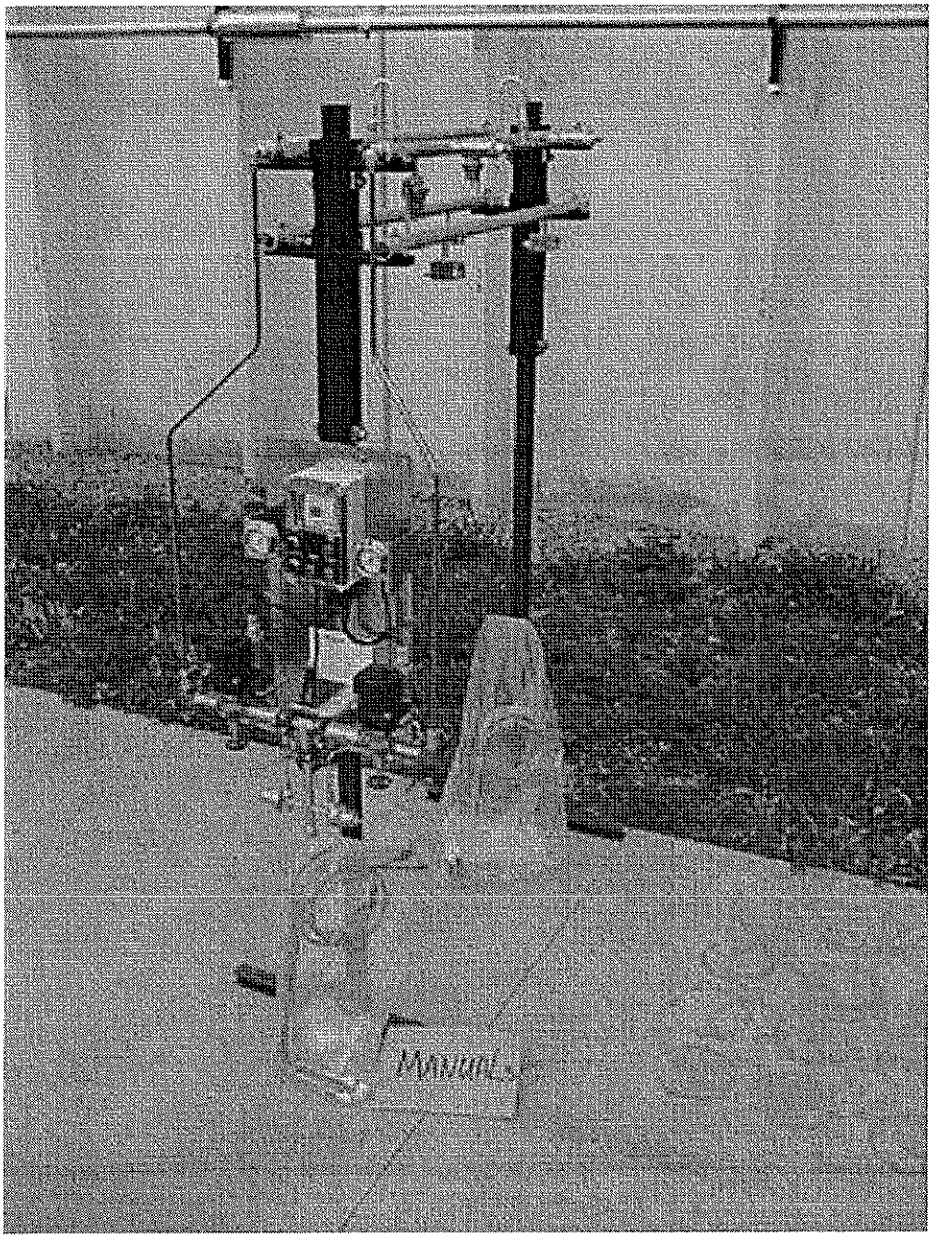


Figure 2 - Out of the Box

Floor Mounting

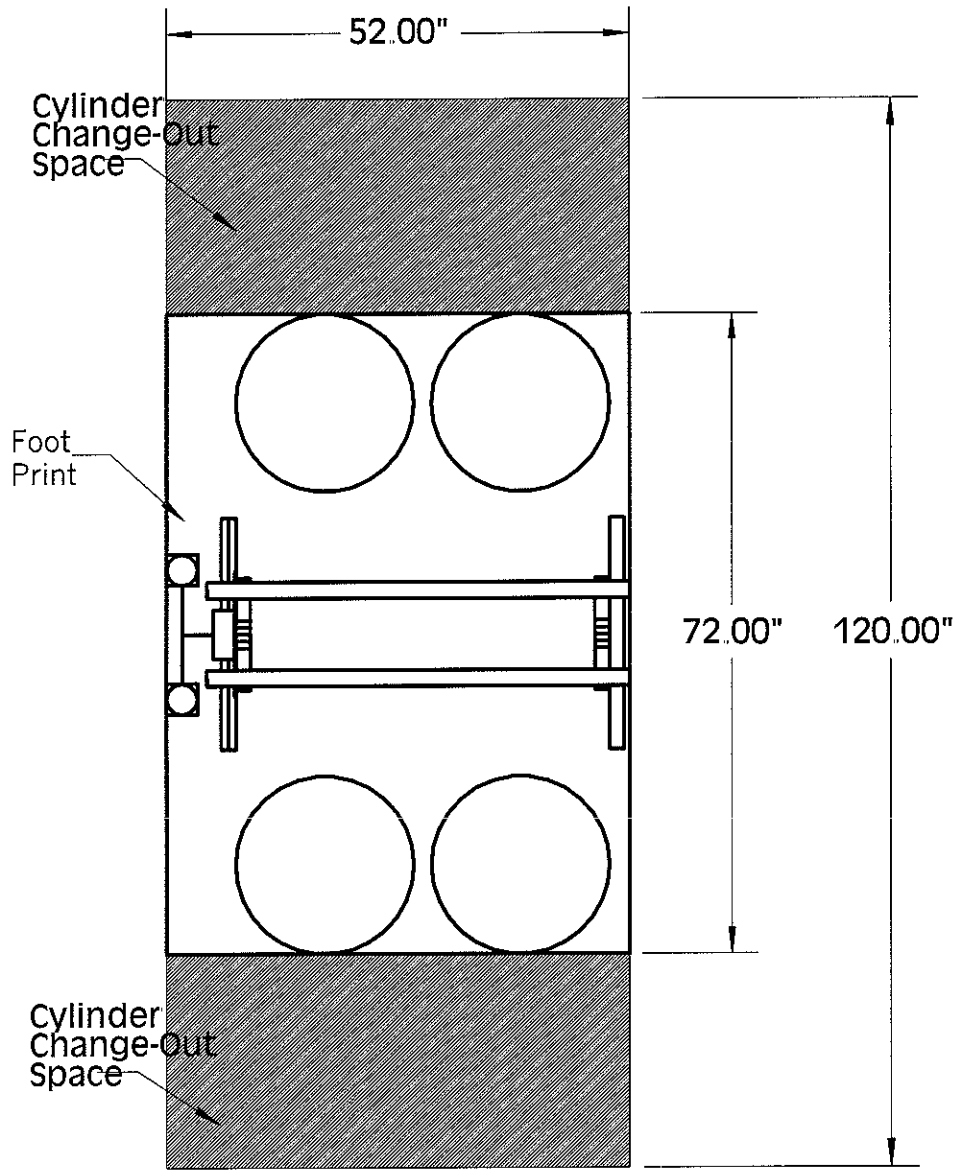


Figure 3 - Floor Mount Foot Print

The manifold is pre-assembled for the floor mount configuration. If additional support is required the manifold frame includes tabs for anchoring to the floor.

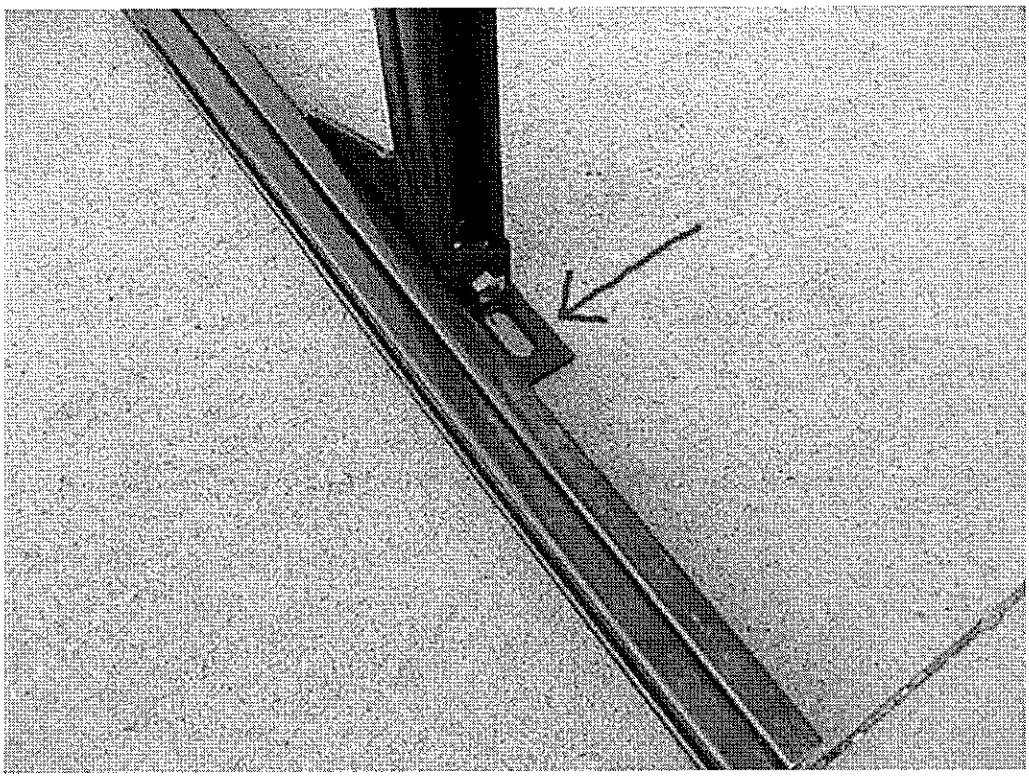
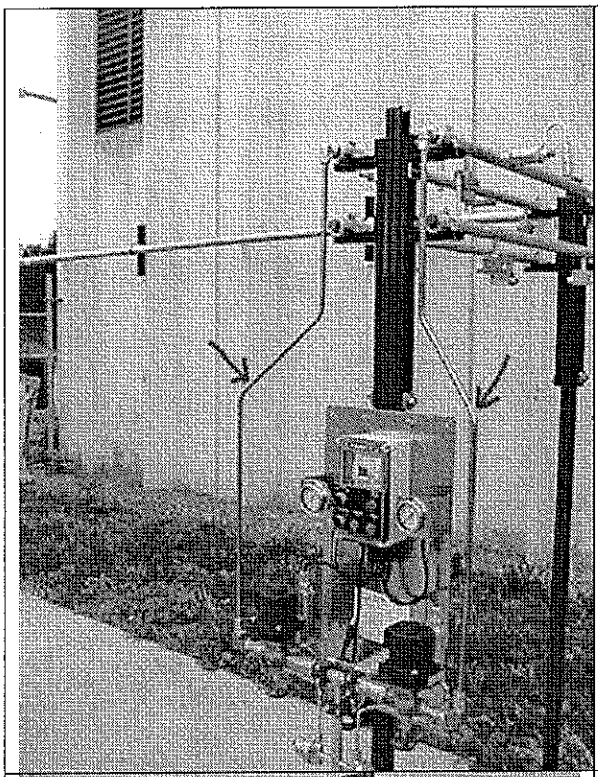
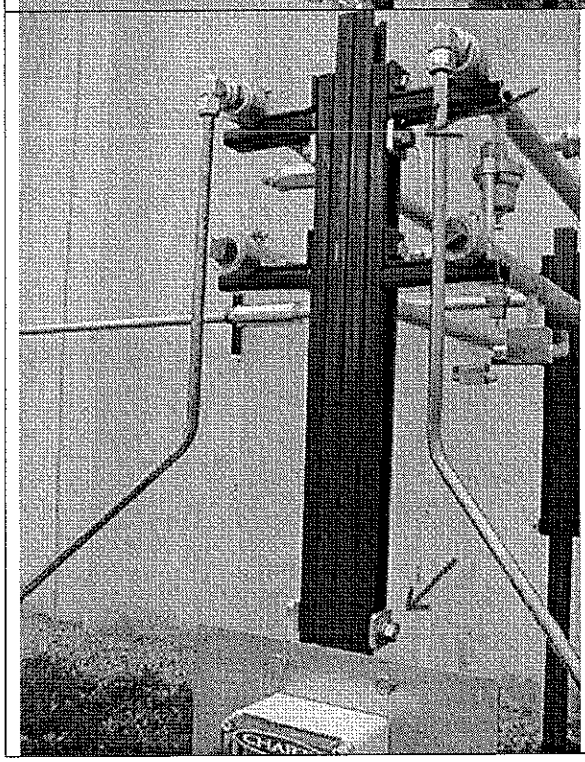
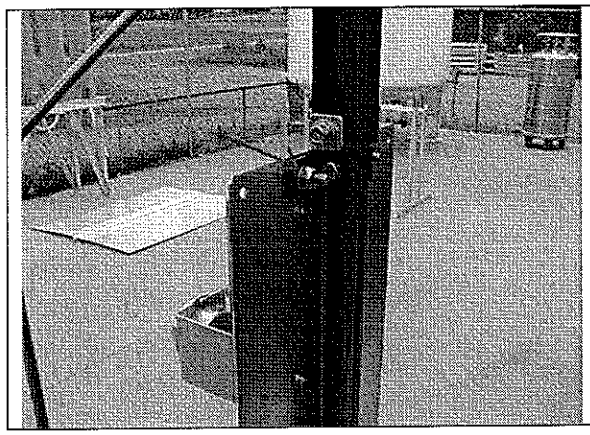


Figure 4 – Floor Mount anchor location

Wall Mounting

The manifold is shipped as a floor mount configuration but can be easily re-configured to a wall mount. Start by breaking down the wall mount configuration by:

	Step 1 – Remove header to switch panel tubing, by loosening the compression fittings.
	Step 2- Remove the headers at the support bracket.



Step 3 – Remove the switch panel, by removing the 4 supporting bolts.

Figure 5 - Wall Mount Configuration

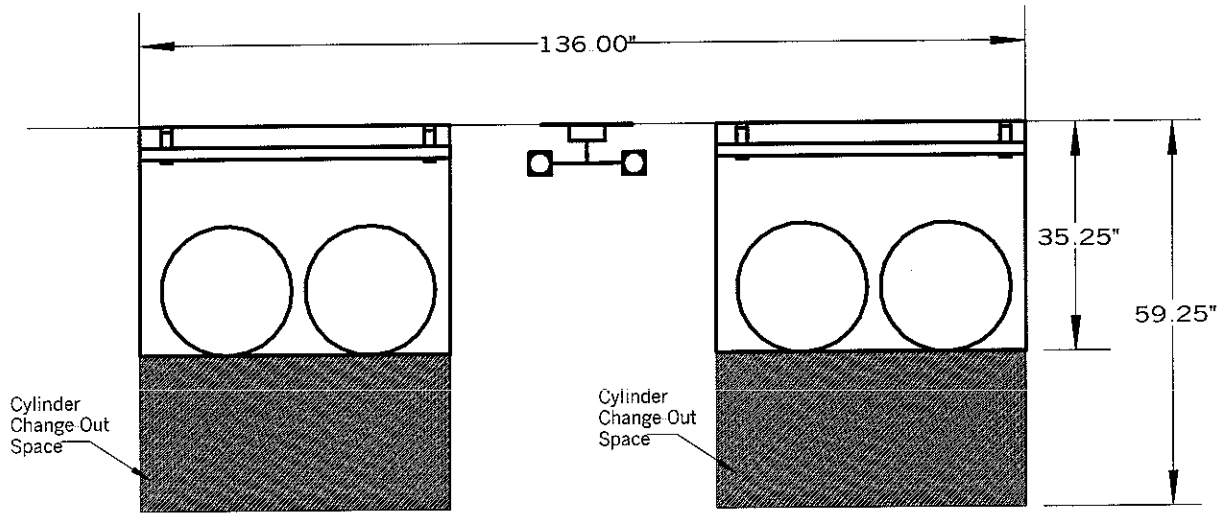
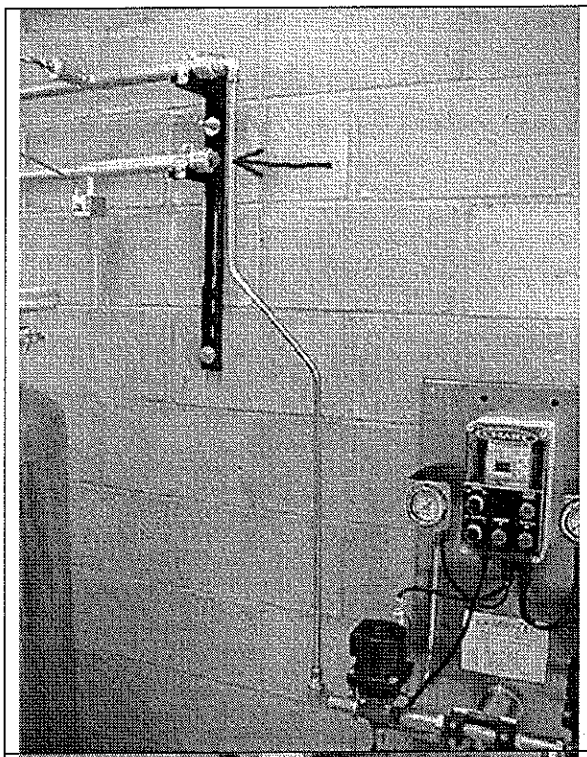
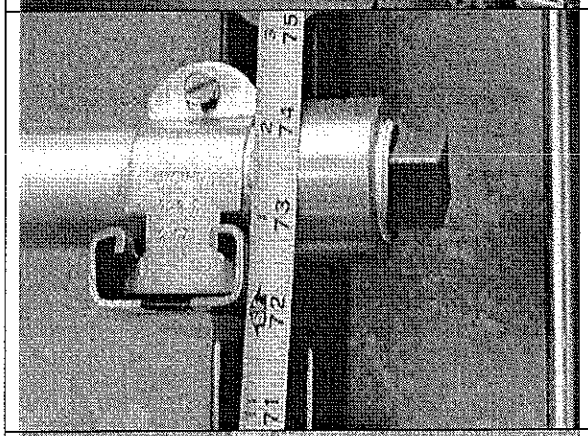
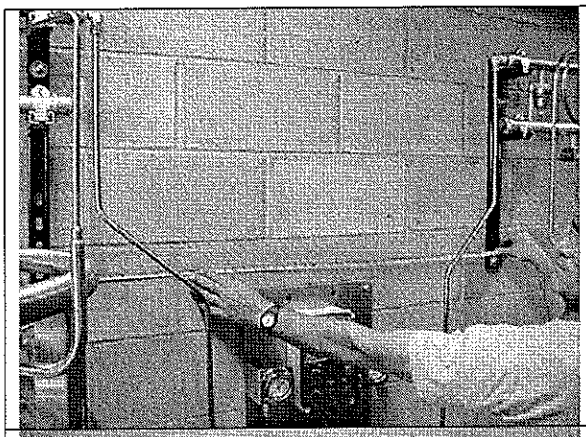
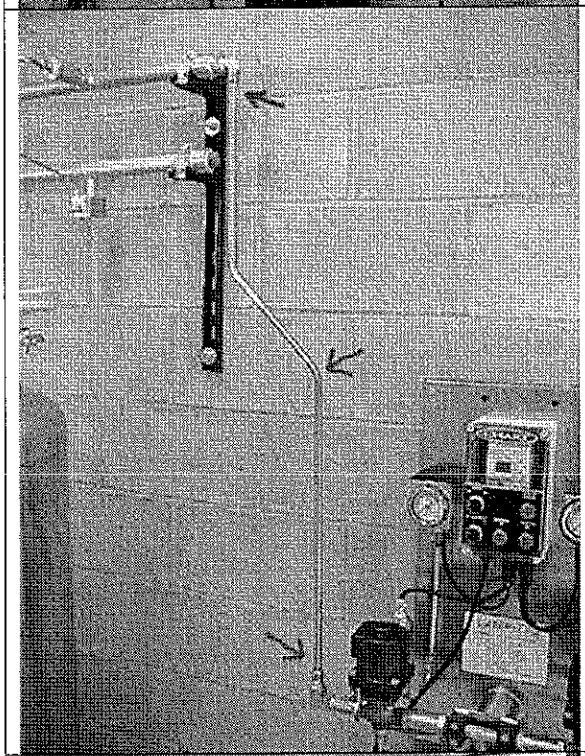
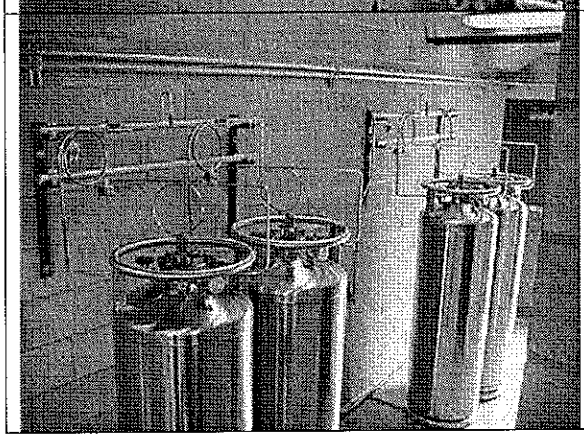


Figure 6 - Wall Mount Foot Print (Note: 86" high)

With the wall location selected to meet the foot print requirements and the floor mount assemble broken down complete the following:

	Step 1 – Locate position of the header brackets and switch panel. Use the following photos with dimensions to locate the components. If the dimensions are followed the connecting header tubes will fit and the flex tubes will connect with ease to your cylinders
	The Vent header is 73 ½" from the floor to the center.
	The panel is 57 ½" from the floor to the top of the panel.

	The header brackets are 46 ½" apart (inside edge to inside edge. The switch panel is located midway between the brackets.
	Step 2 - With components located properly and bolted to the wall install the header tubes by remaking the compression fitting connection.
	Step 3 - Locate the tanks and connect to the header using the flex tubing.

OPERATION

Basic Operation

The Laser-Tec Liquid Cylinder Manifold uses check valves on the liquid header to prevent back flowing to a liquid cylinder that may be at a lower pressure. Excess flow check valves are used on the vent header to prevent the sudden collapse of pressure when one cylinder on one side of the manifold runs empty and vapor rushes into the empty cylinder and out the liquid header. These combinations of check valves allow liquid cylinders to perform far better than simply connected together.

In addition, economizer regulators (backpressure regulators) are used to prevent the loss of excess gas buildup. When the pressure in the vent header reaches the set point of the economizer regulator, gas from the cylinder vapor space is preferentially allowed to be withdrawn, rather than allowed to escape to the atmosphere. To complete the circuit, another economizer regulator is placed downstream of the liquid header that bypasses the solenoid valves. When the pressure in either of the liquid headers reaches the set point of the economizer regulators, gas is allowed to flow downstream to the use point.

The economizer regulators that bypass the solenoid valves have another important purpose. When the changeover operation of the manifold takes place, typically a small volume of cryogenic liquid remains in the liquid header. This liquid expands and builds pressure. Rather than venting that excess gas out the thermal relief device, the economizer allows the excess gas to bypass the solenoid valve and flow to the use point.

Important
The economizer regulators must be adjusted properly to ensure that the liquid header relieves the excess gas buildup to the use point, rather than allowing the thermal relief to open. The thermal relief is a fail safe system and is quite loud when it opens.

Vaporizer

In order to achieve high flow performance, the Laser-Tec Liquid Cylinder Manifold draws cryogenic liquid through the system to minimize pressure drop. To convert the cold cryogenic liquid to warm gas, **an ambient vaporizer must be installed down stream of the manifold.** The vaporizer should be slightly oversized to ensure peak flow demands do not result in cold gas or liquid from exiting the vaporizer. The connection to the manifold can be easily accomplished with a flexible stainless steel transfer hose, rated at the appropriate pressure.

Warning

In the installation of the vaporizer, it is very important to install a safety relief device, on the down stream side of the vaporizer to prevent trapped liquid from over pressurizing the system. It is the installers responsibility to ensure proper safety relief devices are installed.

Regulator

With most cryogenic systems, a final line regulator should be installed to maintain precise control of the pressure. Since the primary application for the Laser-Tec Liquid Cylinder Manifold is designed for high pressure – high flow gas, CHART recommends the CONCOA 623 series high flow regulator.

Liquid Cylinder Installation

To accommodate fast, simple installation of liquid cylinders, the Laser-Tec Liquid Cylinder Manifold includes permanent flexible connections for most cylinder models. There are two connections for each liquid cylinder to be connected to the manifold. The first is the connection of the liquid cylinder (not gas use) is connected to the flexible tube mounted on the top manifold header. The second connects the vent from the liquid cylinder to the bottom manifold header.

The connection tube height can be adjusted by loosening the compression fitting (make sure there is no pressure in the system before loosening the fitting) and pivot the tube so the end connection is adjusted to a different height.

Leak Check

At the initial installation of the Laser-Tec Liquid Cylinder Manifold, the system should be checked for leaks that may have developed due to road vibration during shipment. With the liquid cylinders installed, and the manual override valves on the solenoid valves in the closed position (hand wheel backed away from the solenoid valve body), slowly open the vent valve on the liquid cylinder and check for leaks at the connections on the lower header (vent). Next, slowly open the liquid valve on the liquid cylinder. You will be able to read the pressure directly at the pressure gauge on the switchover module. Check for leaks at all connections.

Pre-Charge the Vaporizer

To avoid erratic pressure swings at startup, the downstream line, including the ambient vaporizer, should be pre-charged with gas. This can be accomplished by slowly opening the manual override handwheel on one of the solenoid valves until the pressure equalizes. Again, check for leaks.

Set Minimum Pressure

The Laser-Tec Liquid Cylinder Manifold is equipped with an adjustable set point for the minimum pressure desired down stream. The set point can be adjusted by unscrewing and removing the faceplate on the pressure gauge. The red indicator needle can be readjusted to the desired set point. Replace the faceplate and repeat for the second pressure gauge. The system will now switch over when the cylinder pressure, as measured at the manifold pressure gauge, drops below the red indicator needle.

Power Up

With the previous tasks complete, the system is now ready to be powered up. Plug in the power connection to any 15 amp 110 Vac electrical outlet. Use the selector switch to choose the desired bank as the primary bank, and turn on the power switch. The appropriate solenoid valve will be energized (opened) and a green indicator light will indicate the bank that is in operation.

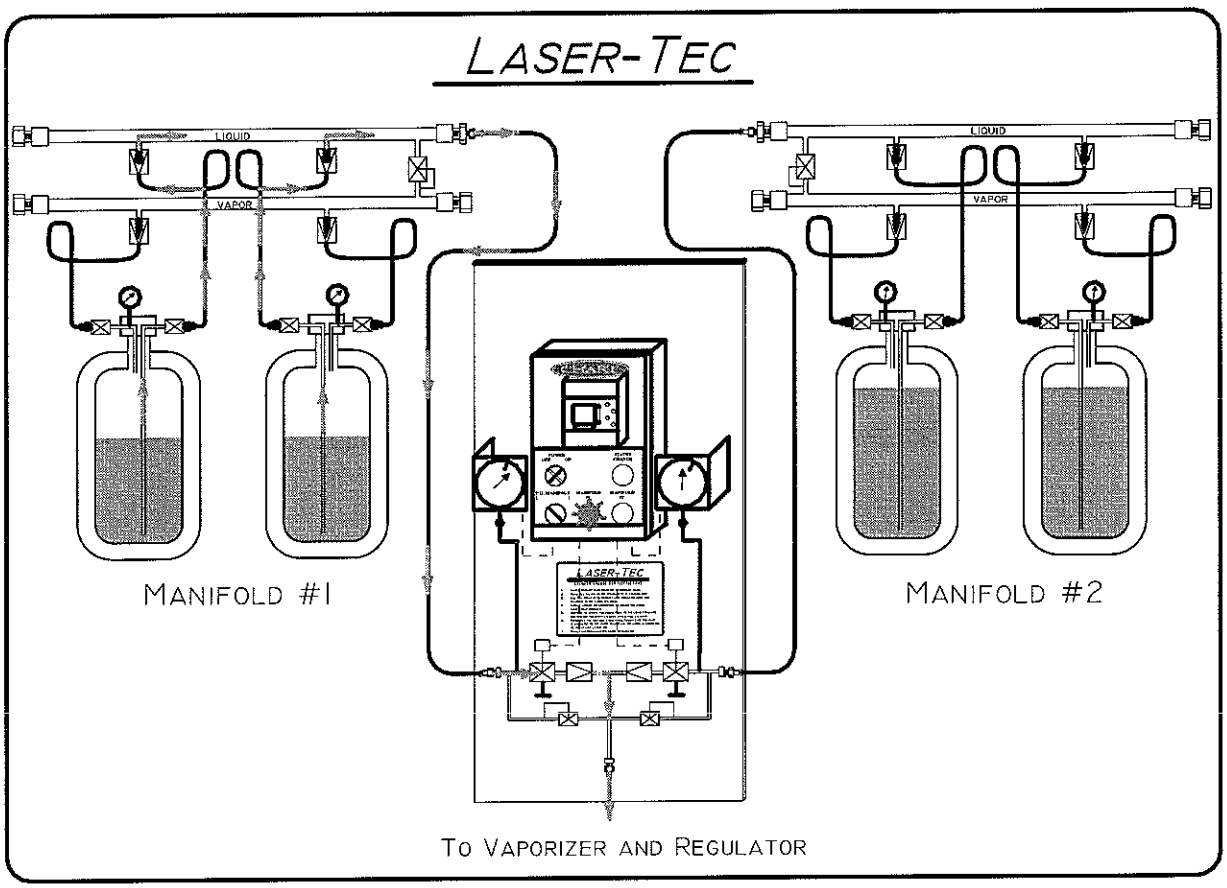


Figure 7 - Primary Manifold Draw

Primary Manifold Draw

Liquid is delivered to the valve panel and to the vaporizer from the liquid cylinder through the liquid cylinder dip tube, the manifold check valve, the manifold, the switch panel solenoid valve, and through a check valve (figure 2). The electronic control box Manifold #1 light is illuminated during this stage. As long as the pressure stays above the set point the system will continue to draw through this path. The "Pri. Manifold" switch is positioned to 1, this means that manifold #1 is the primary manifold. The system will draw on the primary manifold until its pressure falls below the set point.

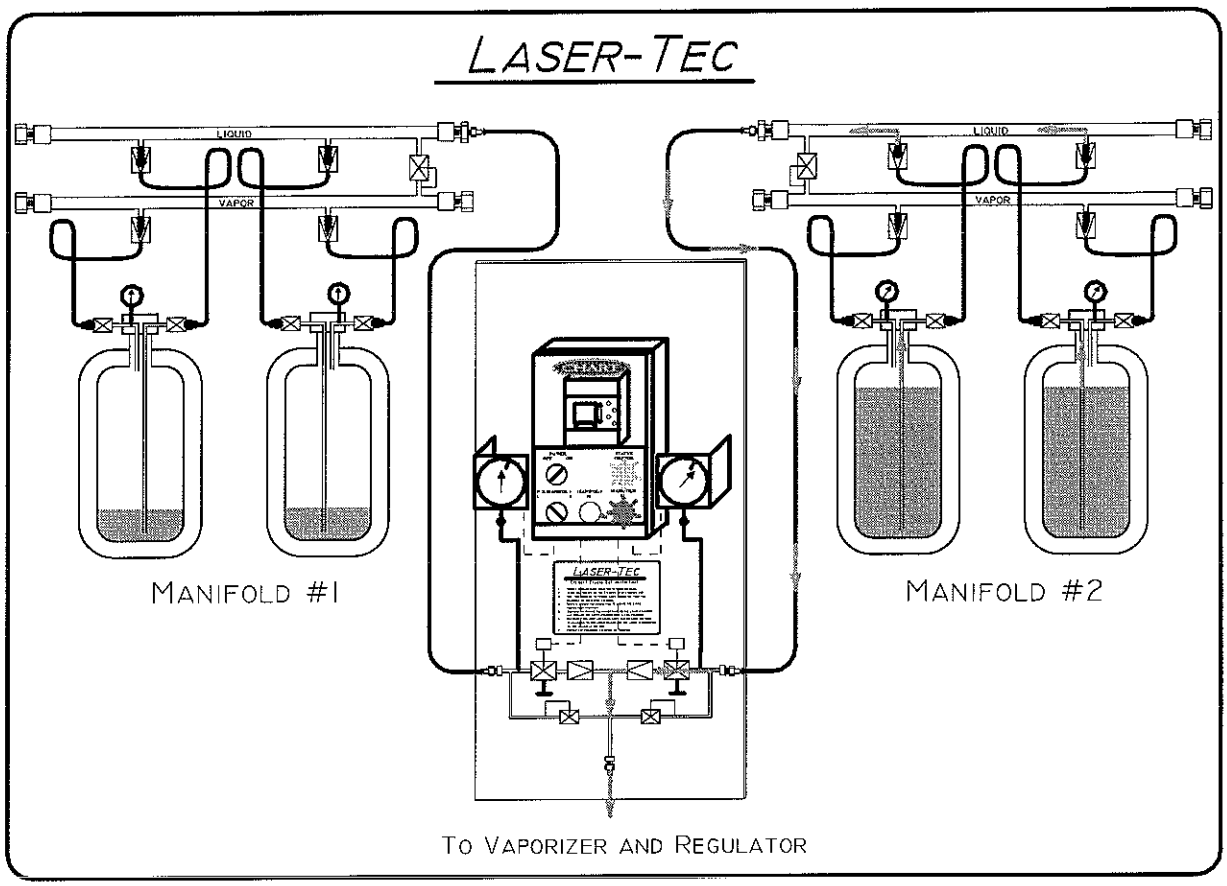


Figure 8 - Primary Bank Pressure Drop

Primary Bank Pressure Drop

When the pressure drops below the set point, the controller switches to manifold #2 and continues to monitor the primary bank's pressure. When the pressure recovers, in the primary bank, the system switches back to the primary bank and uses the remaining liquid. The status change light and the manifold #2 light are illuminated. Depending on the pressure and flow requirements this step may be required to occur several times.

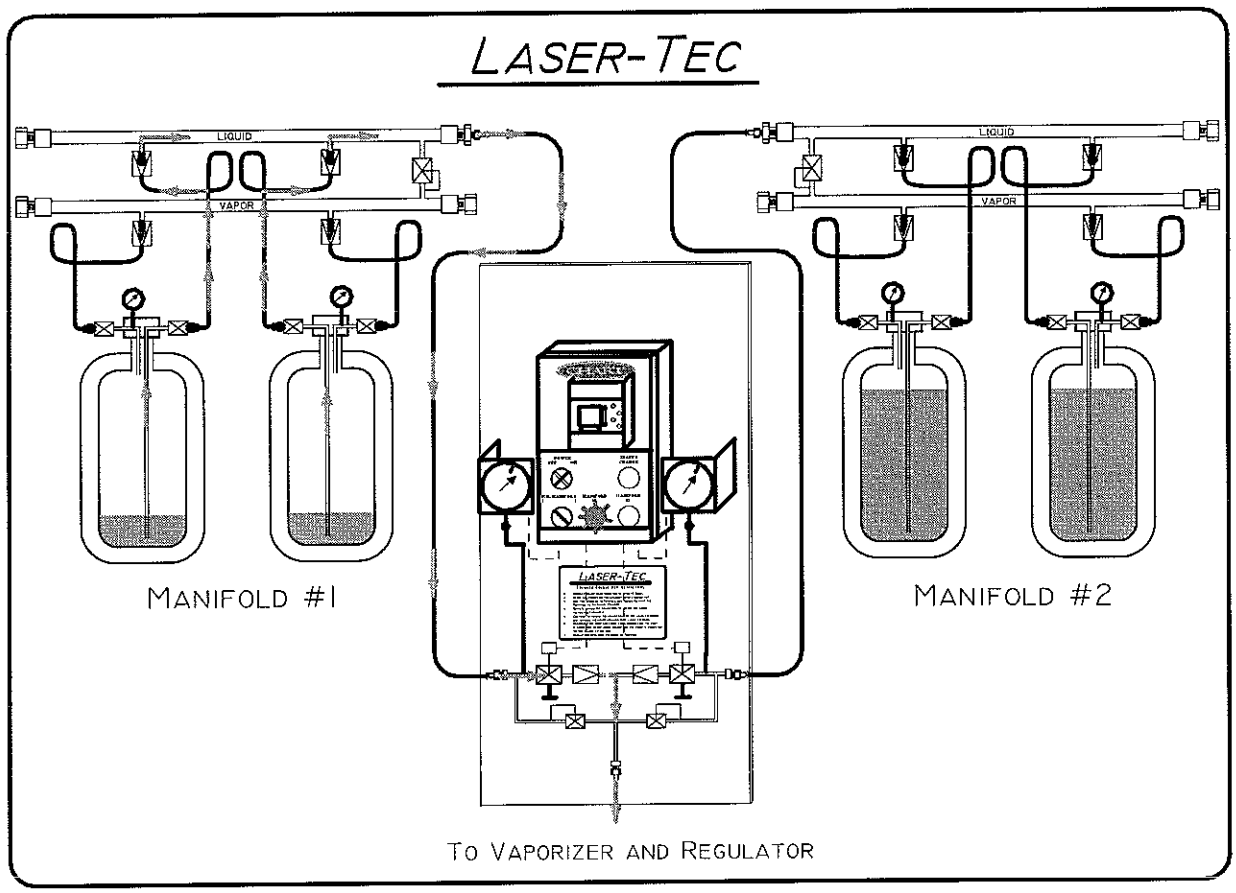


Figure 9 - Switch Back To Primary Manifold

Switch Back to Primary Manifold

If the pressure recovers in the primary bank the control system waits 5 minutes to allow cylinders to build sufficient pressure to delivery the remaining liquid. The manifold that is being drawn from can be determined by the manifold lights illumination. The system will continue to draw until there is a pressure drop below the set point.

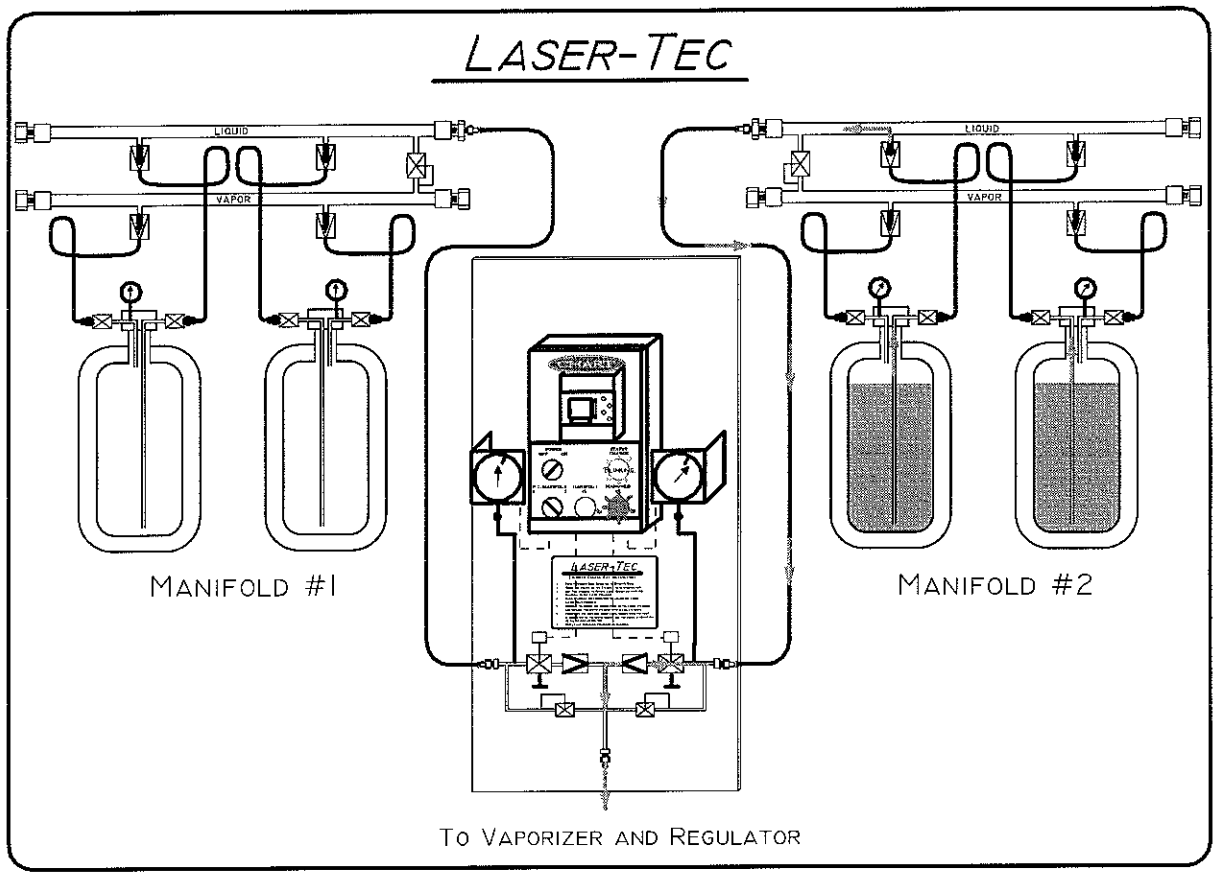


Figure 10 - Cylinder Change Required

Cylinder Change Required

When the primary bank is empty, the status light will blink. The system will continue to draw from the secondary bank. The cylinders in the primary bank cylinders must be exchanged. As an option the controller has an output that allows communication to telemetry.

Cylinder Change Procedure

LASER-TEC

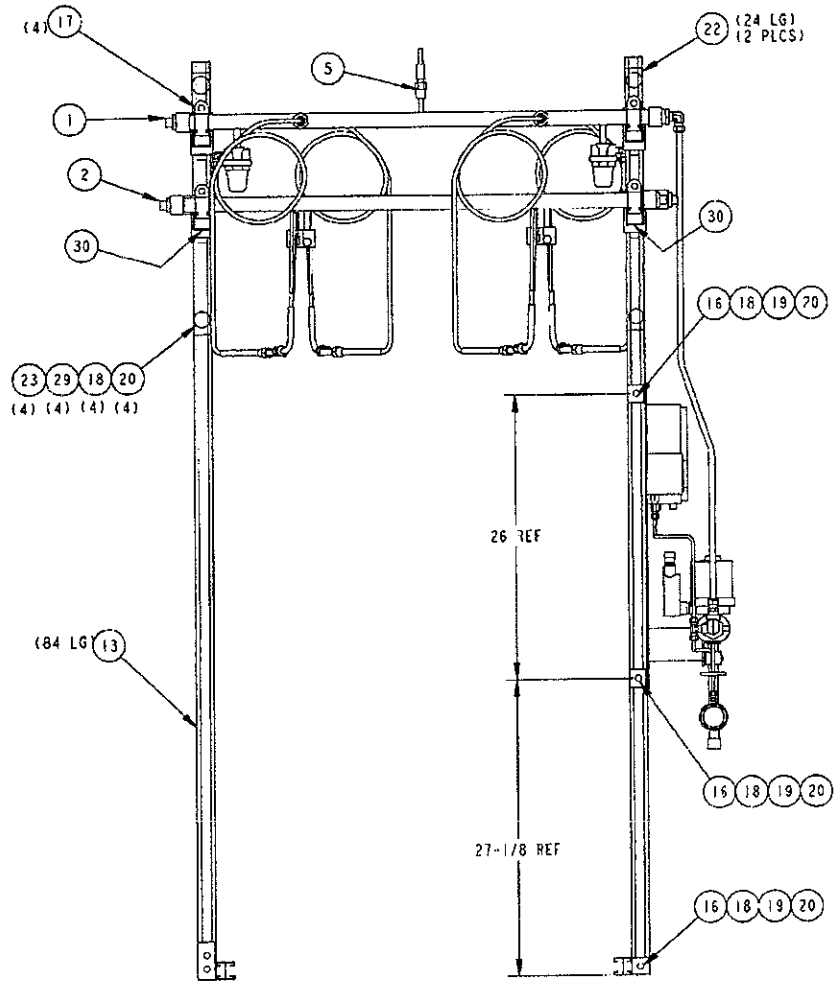
CYLINDER CHANGE OUT INSTRUCTIONS:

1. SWITCH PRIMARY BANK SELECTOR TO OPPOSITE BANK.
2. CLOSE ALL VALVES ON THE CYLINDER TO BE CHANGED OUT.
3. USE TWO WRENCHS TO REMOVE LINES CONNECTED FROM THE MANIFOLD TO THE LIQUID CYLINDER
4. SLOWLY, LOOSEN THE CONNECTION TO ASSURE THE CHECK VALVES SEAT PROPERLY.
5. CONTINUE TO REMOVE THE CONNECTIONS TO THE LIQUID CYLINDERS AND REPLACE THE EMPTY CYLINDER WITH A FULL CYLINDER.
6. RECONNECT THE VENT AND LIQUID LINES, MAKING SURE THE VENT IS CONNECTED TO THE LOWER HEADER AND THE LIQUID IS CONNECTED TO THE HEADER AT THE TOP.
7. REPEAT FOR REMAINING CYLINDERS ON MANIFOLD.

APPENDIX 1 – FLOOR MOUNT PARTS LIST AND DRAWINGS

Chart p/n 11208000

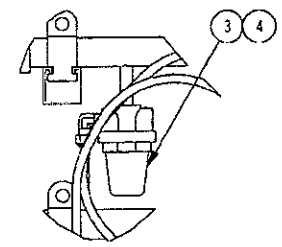
PART #	DRAWING SEQ #	DESCRIPTION
11357419	1	HEADER S/A TOP LASER-TEC
11357401	2	HEADER S/A BOTTOM LASER-TEC
10619675	3	REGULATOR .250NPT @ 475PSI
10501677	4	ELBOW SS 90D 3/8ODT*1/4MPT
1812702	5	RV BRS 1/4MPT 550PSI
11051090	6	VALVE CHECK BRS 1/2FPT*1/2FPT
10501651	7	CONN SS 3/8ODT*1/2MPT
11208587	8	VALVE EXCESS FLOW CHECK 1/4
10501327	9	ELBOW SS 90D 1/4ODT*1/4MPT
11357742	10	COIL ASSY VAPOR 1/4"OD
11357700	11	COIL ASSY LIQ 3/8"OD
11359107	12	LASER-TEC VHP SYSTEM
11360888	13	CHANNEL UNISTRUT P4101 10'LG'S
11360925	14	BRACKET UNISTRUT
11360933	15	BRACKET 90D UNISTRUT
11360941	16	BRACKET 90D UNISTRUT
11360917	17	PIPE CLAMP 1"PS
11360950	18	NUT CHANNEL 1/2"-13 W/SPRINGS
2912801	19	HHCS SS 1/2-13*1"LG
2911161	20	WASHER LOCK SS 1/2 18-8
2911541	21	NUT HEX SS 1/2-13
11360896	22	CHANNEL UNISTRUT P4100 10'LG'S
11382075	23	HHCS SS 1/2-13*1-3/4"LG
1210422	24	ELBOW BRS 90D 1/2FPT
10501917	25	CONN SS 1/2ODT*1/2MPT
11381849	26	TUBE 1/2"OD BENT
10821110	27	BSHG HEX BRS 1MPT*1/2FPT
10504296	28	ELBOW SS 90D 1/2ODT*1/2MPT
11382083	29	WASHER FLAT SS 1.375OD*.562ID
11382358	30	LABEL WALL MOUNT LOCATION
11382374	31	LABEL LASER-TEC CHANGE OUT
11382366	32	LABEL CHART LOGO 4*1
11382577	33	LABEL CHART LOGO 1-1/2*3/8



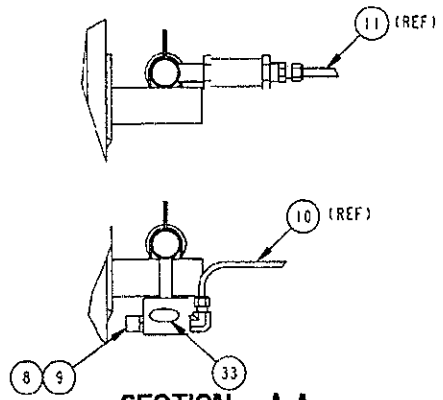
BACK VIEW

NOTE:
1 PRESSURE TEST TO 475 PSI

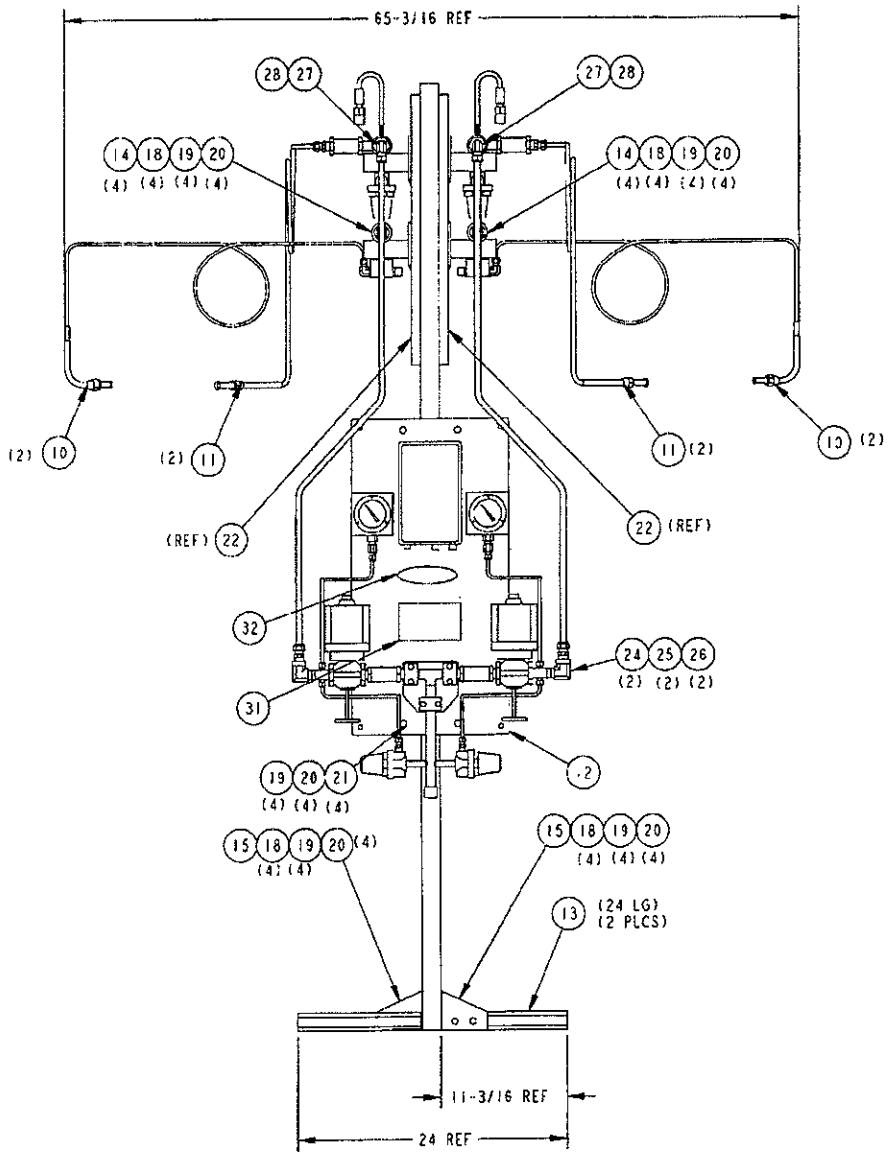
PART NO.	DESCRIPTION	REV.
11208300	LASER-TEC VHP MANIFOLD FLOOR MTD	
11364791	LASER-TEC MP MANIFOLD FLOOR MTD	
11364320	LASER-TEC HP MANIFOLD FLOOR MTD	



SECTION B-B
SCALE 1/4
(2 PLCS)

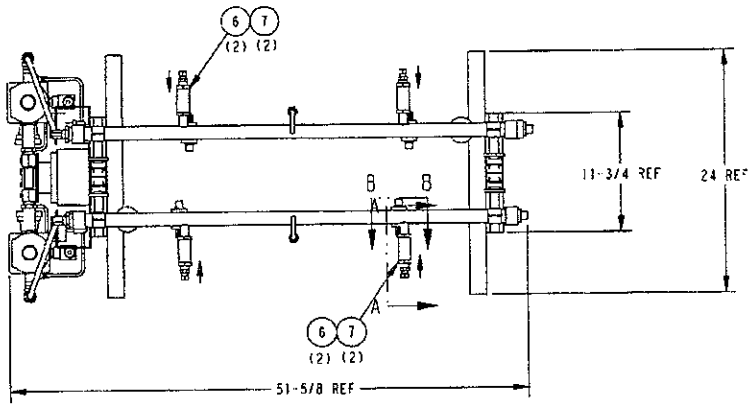


SECTION A-A
SCALE 1/4
(4 PLCS)

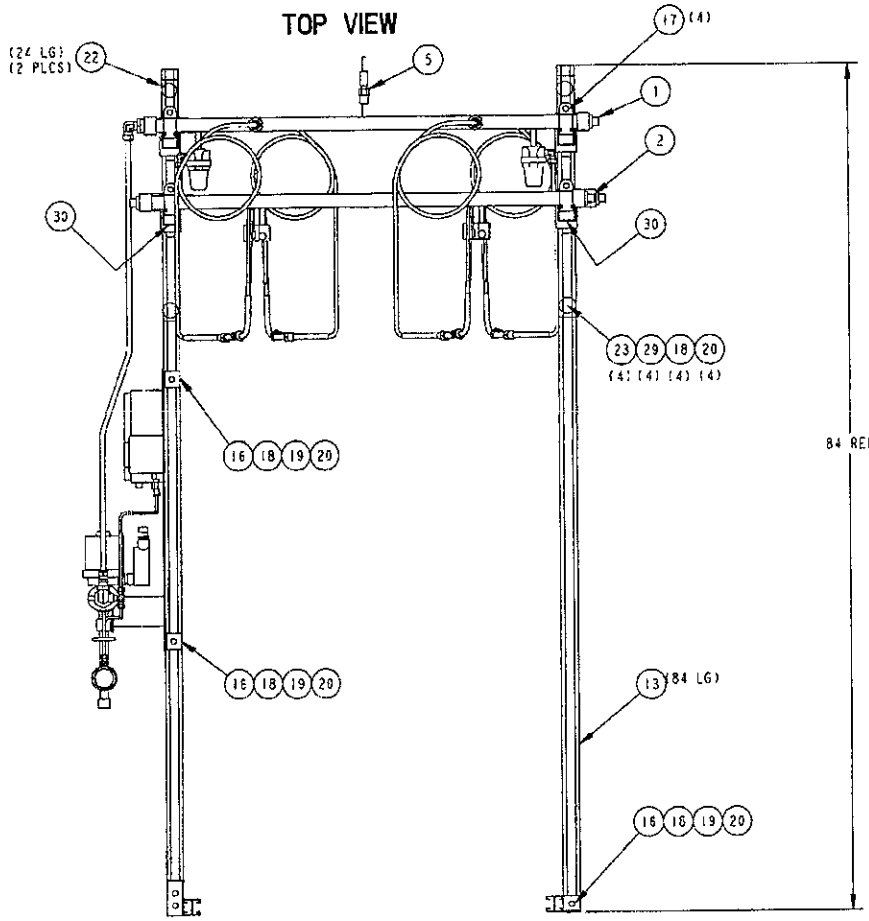


SIDE VIEW

DRAWING NO. D-11208000



TOP VIEW



FRONT VIEW

REV	ECR NO	REVISION DESCRIPTION	BY	DATE
A	11444	ADDED WALL MOUNT HDWR	TJS	8/2/00

	APPROVED	DATE
DRAWN	TJS	5/17/00
CHK'D	-	-
ENG APP	KJR	5/19/00
PROJ ENGR	-	-
MFG APP	KB	5/19/00
QUAL CONT	LB	5/24/00

NEXT ASS'T	USED ON	NEXT ASS'T	FINAL ASS'T
	APPLICATION		QUANTITY REQ'D

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MAT'L: SEE B O M

PART NUMBER: SEE TAB BLK

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES:
FRACTIONS ± 1/8
ANGLES ± °
2 PLACE DECIMALS ± NA
3 PLACE DECIMALS ± NA

MVE Inc
NEW PRAGUE, MINNESOTA USA 56071

TITLE: LASER-TEC MANIFOLD FLOOR MOUNT

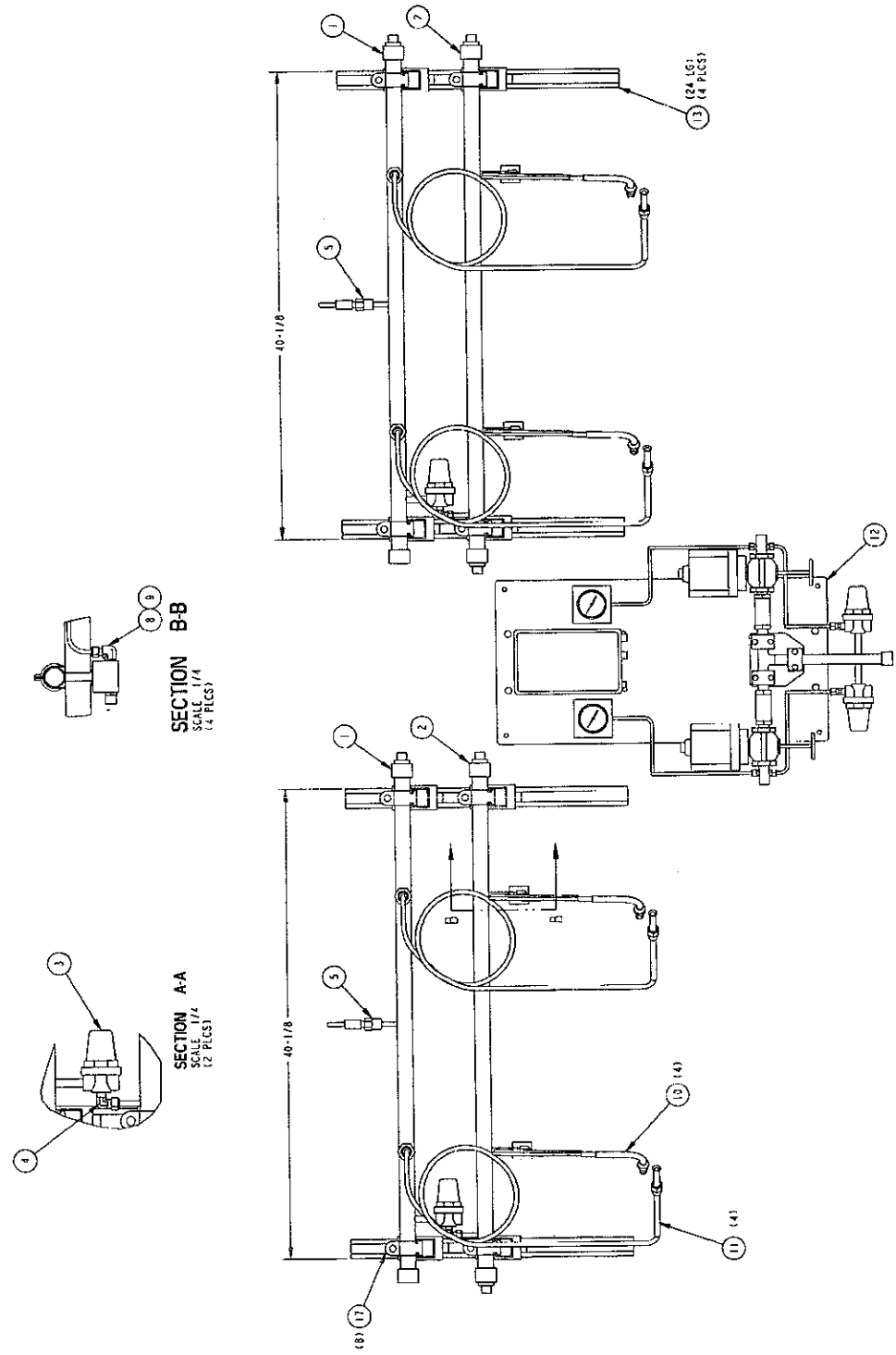
DRAWING NO. D-11208000 REV A

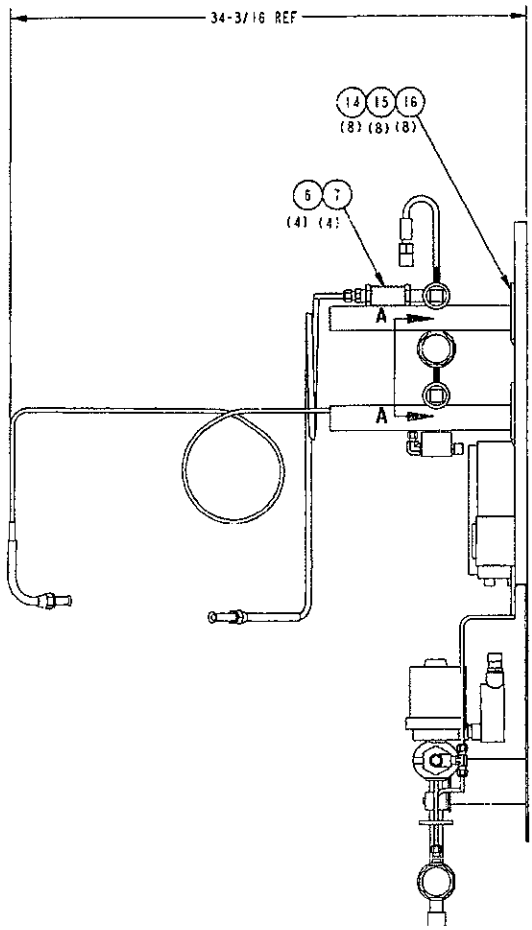
SCALE 1/8"=1" | DO NOT SCALE DRAWING | SHEET 1 OF 1

APPENDIX 2 - WALL MOUNT PARTS LIST AND DRAWINGS

Chart p/n 11208000

PART #	DRAWING SEQ #	DESCRIPTION
11357419	1	HEADER S/A TOP LASER-TEC
11357401	2	HEADER S/A BOTTOM LASER-TEC
10737831	3	REGULATOR .250NPT @ 200PSI
10501677	4	ELBOW SS 90D 3/8ODT*1/4MPT
1812702	5	RV BRS 1/4MPT 550PSI
11051090	6	VALVE CHECK BRS 1/2FPT*1/2FPT
10501651	7	CONN SS 3/8ODT*1/2MPT
11208587	8	VALVE EXCESS FLOW CHECK 1/4
10501870	9	ELBOW SS 90D 1/4ODT*1/4FPT
11357742	10	COIL ASSY VAPOR 1/4"OD
11357700	11	COIL ASSY LIQ 3/8"OD
11364774	12	LASER-TEC MP SYSTEM
11360896	13	CHANNEL UNISTRUT P4100 10'LG'S
11360925	14	BRACKET UNISTRUT
11360950	15	NUT CHANNEL 1/2"-13 W/SPRINGS
11360909	16	HHCS SS 1/2-13*3/4"LG
11360917	17	PIPE CLAMP 1"PS


SECTION B-B
SCALE 1/4
(4 PLCS)
SECTION A-A
SCALE 1/4
(2 PLCS)
40-1/8
40-1/8
(24 LG)
(4 PLCS)
NOTE:
1. PRESSURE TEST TO 475 PSI



REV	ECR NO	REVISION DESCR PT ON	BY	DATE

	APPROVED	DATE
DRAWN	TJS	5/18/00
CHK'D	-	-
MFG ENGR.	KJR	5/19/00
PROJ ENGR.	-	-
MFG MGR.	KB	5/19/00
QUAL CONT.	LBL	5/24/00

NEXT ASS'Y | USED ON | NEXT ASS'Y | FINAL ASS'Y

APPLICATION | QUANTITY REQ'D

MVE Inc
MVE NEW PRAGUE, MINNESOTA USA 56071

TITLE LASER-TEC MANIFOLD WALL MOUNT

DRAWING NO. D-11207998 REV

SCALE 3/16"=1" | DO NOT SCALE DRAWING | SHEET 1 OF 1

MATL SEE BOM

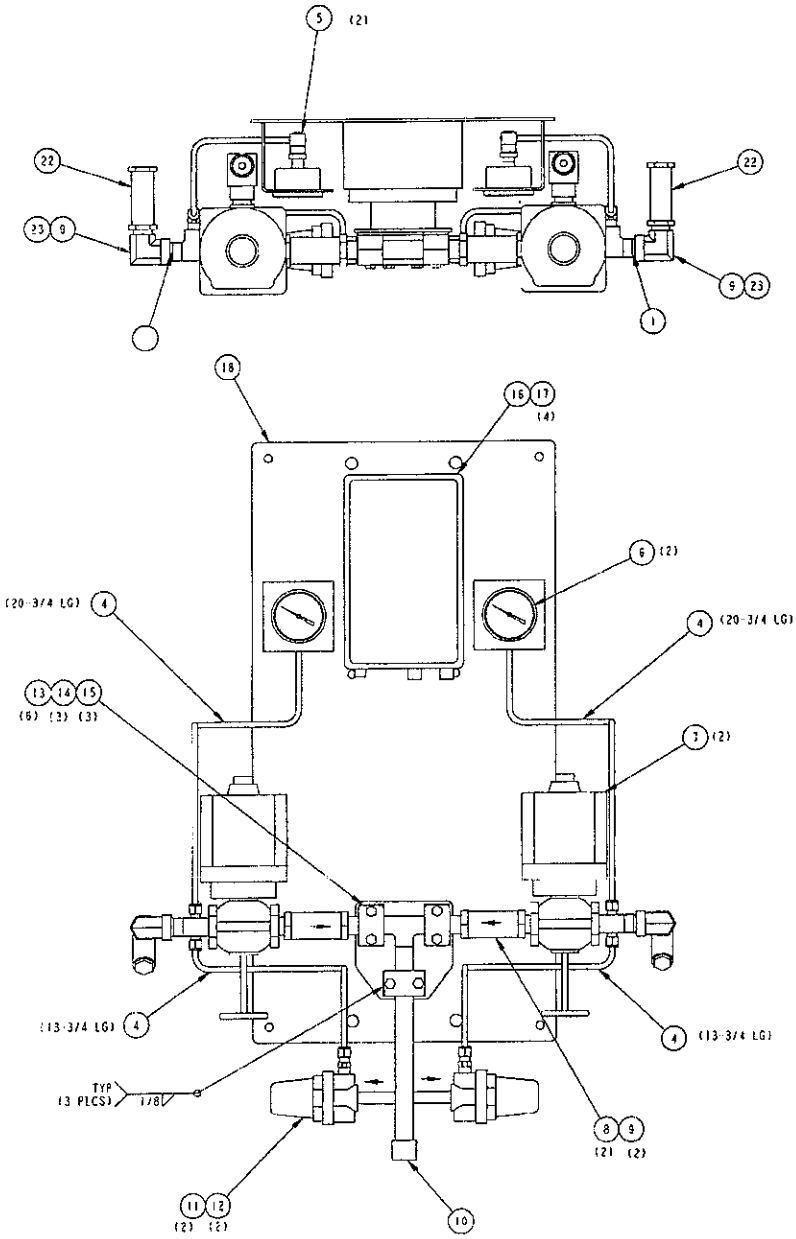
PART NUMBER 11207998

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONS ± 1/8
ANGLES ± 1°
2 PLACE DECIMALS ± NA
3 PLACE DECIMALS ± NA

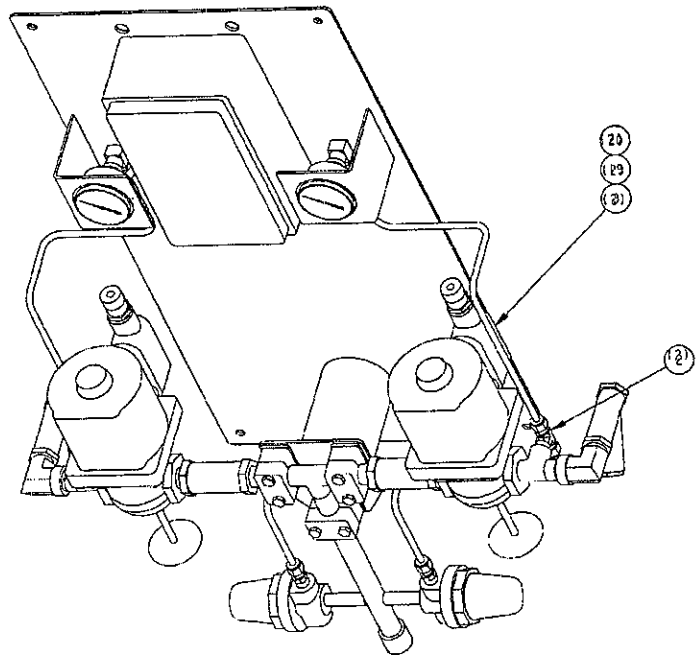
APPENDIX 3 – LASER-TEC SYSTEM (SWITCH OVER PANEL) PARTS LIST AND DRAWINGS

Chart p/n 11359107 Laser-Tec System VHP
Chart p/n 11364803 Laser-Tec HP System
Chart p/n 11364774 Laser-Tec MP System

PART #	DRAWING SEQ #	DESCRIPTION
11050337	1	TEE BRS 1/2MPT*1/2MPT*1/4FPT
10504165	2	TEE SS M BR 1/4T*1/4T*1/4MPT
11371464	3	PHFLMS SS #6-32*1/2"LG
272004	4	TUBE SS .250"OD .049W WLD
1212011	5	ELBOW STREET SS 90D 1/4NPT
11208093	6	PG 2-1/2"DIAL 0-600PSI/BAR1/4"
10925509	7	VALVE SOLENOID 1/2FPT 500PSI
11051090	8	VALVE CHECK BRS 1/2FPT*1/2FPT
10655561	9	NIPPLE CLOSE SS 1/2NPT
11358981	10	ECONO SYSTEM
10501247	11	CONN SS 1/4ODT*1/4MPT
10619675 **VHP**	12	REGULATOR 250NPT @ 475PSI
2110752 **HP**	12	REGULATOR 250NPT @ 325pSI
10737831 **MP**	12	REGULATOR 250NPT @ 200psi
3411226	13	STAUFF CLAMP 1/2PS
3411111	14	WELD PLATE SP 3000 SERIES
2913091	15	HHCS SS 1/4-20*1-3/8"LG
11209424	16	ELECTRICAL CONTROL BOX LAZER
11371721	17	PHPNHMS SS #8-32*1"LG
11360415	18	CONTROL PANEL ASSY
11360044	19	OUTLET BODY 1/2"PS W/COVER AND
11360036	20	NUT GLAND W/NEOPRENE BSHG
11371771	21	TUBE PVI INSUL AWG 6
2911661	23	NUT THIN SS 6-32 18-8
2912291	24	WASHER LOCK #6 EXTERNAL TOOTH
10521951	25	ADAPTER SS 1/4NPT*1/4FPT
10501052	26	CONN SS 1/4ODT*1/4FPT
2910631	27	NUT HEX SS 8-32 18-8
2952331	28	WASHER FLAT SS #8 18-8



NOTE.
1 PRESSURE TEST TO 475 PSI



SCALE 5/16

PART NO.	DESCRIPTION	REV
11359107	LASER-TEC VHP SYSTEM	
11364774	LASER-TEC NP SYSTEM	
11364803	LASER-TEC HP SYSTEM	

REV	ECR NO	REVISION DESCRIPTION	BY	DATE

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MAT'L SEE B O M

PART NUMBER SEE TAB BLK

	APPROVED	DATE
DRAWN BY	TJS	5/15/00
CH'K'D BY	-	-
ENG. DEVP.	KJR	5/19/00
PROJ. ENGR.	-	
MFG. ENGR.	KB	5/19/00
QUAL. CONT.	LBL	5/24/00

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES:
FRACTIONS ± 1/8
ANGLES ± °
2 PLACE DECIMALS ± .XX
3 PLACE DECIMALS ± .XXX

NEXT ASS'Y USED ON | NEXT ASS'Y FINAL ASS'Y

APPLICATION | QUANTITY REQ'D

MVE Inc
MVE NEW PRAGUE, MINNESOTA USA 56071

TITLE
LASER TEC SYSTEM

DRAWING NO. D-11359107 REV

SCALE 5/16"=1" DO NOT SCALE DRAWING SHEET 1 OF 1

APPENDIX 4 - SCHEMATIC