Paul Mueller Company
1600 W. Phelps St., Springfield, MO 65802

Installation Operation with Start-Up Instructions

Package and Split System Chillers

VERY IMPORTANT!!!

PLEASE DO NOT TURN THE POWER ON TO YOUR NEW PAUL MUELLER PRODUCT UNTIL THE ENCLOSED – FIELD COMMISSIONING CHECKLIST HAS BEEN COMPLETED BY A QUALIFIED TECHNICIAN.

Phone (toll-free): **417-575-9000** • Email: contact@paulmueller.com
Website: www.paulmueller.com

Paul Mueller Company • (rev 01/27/2022)

MUELLER

Packaged & Split-System Chillers • Chilled Water & Fluid Handling Solutions

Air-Cooled Scroll
Process Chillers

Air-Cooled Semi-Hermetic
Process Chillers

Air & Water Cooled Scroll
Portable Chillers

Water-Cooled Scroll
Process Chillers

Water-Cooled Semi-Hermetic
Process Chillers

Tank & Pump Packages

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Thank You for Your Purchase! As a Valued Customer, We are Here for Your Support.

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Dear Valued Customer,

Congratulations on delivery of your new Paul Mueller Company equipment and welcome to our family. We appreciate your trust in us and we look forward to providing you with the highest quality American Built products on the market.

Best Regards,

Paul Mueller Company
Mueller Brewery Products

After delivery of your new Paul Mueller Company product... the following items will be critical to assure years of trouble free service from your new equipment:

- Factory level commissioning
- Plumbing system design and component selection
- Plumbing system installation
- Electrical service design installation and connection
- Regular scheduled service

Important, Please Read & Complete the –
FIELD COMMISSIONING CHECKLIST
in the back section of this booklet.

IMPORTANT!
READ BEFORE INSTALLING.

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- **THIS EQUIPMENT MUST BE INSTALLED BY QUALIFIED PERSONNEL IN ACCORDANCE WITH ALL LOCAL AND NATIONAL CODES.**

- **AN EARTH GROUND LUG IS PROVIDED ON THE CABINET INTERIOR FOR PROPER GROUNDING ACCORDING TO NATIONAL ELECTRICAL CODES. AN EARTH GROUND IS NECESSARY TO ENSURE PERSONNEL SAFETY TO PREVENT ELECTRICAL HAZARDS AROUND THIS EQUIPMENT.**

- **THIS EQUIPMENT IS NOT FOR USE AS AN INDUSTRIAL WATER SOURCE FOR DRINKING OR FOOD INGREDIENT WATER FOR HUMANS OR ANIMALS UNLESS IT WAS SPECIFICALLY DESIGNED FOR THIS PURPOSE BY PAUL MUELLER COMPANY.**

- **READ AND FOLLOW INSTALLATION INSTRUCTIONS FOR PROPER OPERATION.**

- **THE MAIN ELECTRICAL SUPPLY TO THIS EQUIPMENT MUST REMAIN ON TO KEEP COMPRESSOR CRANK CASE HEATERS FUNCTIONAL. FAILURE TO DO SO CAN RESULT IN NON-WARRANTY COMPRESSOR DAMAGE.**

- **THIS UNIT IS EQUIPPED WITH A PILOT DUTY FLOW SWITCH. THE CHILLER'S REFRIGERATION SYSTEM WILL NOT OPERATE UNLESS THE CIRCULATION PUMP IS CIRCULATING WATER THROUGH THE EVAPORATOR.**

Section 1 – Unit Inspection and Accepting Delivery

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Upon delivery of your new Paul Mueller Company equipment:

1. Verify that the equipment is the correct model, voltage and phase against the order confirmation supplied by Paul Mueller Company.

2. Verify the serial number matches that on the bill of lading.

3. Inspect all exterior components for visible damage. Report any apparent damages or material shortages to the carrier and make a notation on the delivering carrier's bill of lading copy. Specify the extent and type of damage and then notify Paul Mueller Company immediately. **Do not proceed with the installation of a damaged unit without the approval of Paul Mueller Company; to do so will be at the risk of assuming all responsibility for the damage.**

***** PROTECT YOURSELF: IF THE EQUIPMENTS EXTERIOR CRATING SHOWS ANY SIGNS OF DAMAGE, NOTATE ON THE BILL OF LADDING "POSSIBLE FREIGHT DAMAGE" BEFORE THE DRIVER LEAVES. ALWAYS TAKE PICTURES OF ANY SUSPECT DAMAGE.**

Inspection Checklist — To protect against loss due to damage incurred in transit complete the following checklist:

____Inspect each piece before accepting delivery. Check for torn cartons, broken skids, bent sheet metal, torn shrink wrap.

____Check the unit(s) for concealed damage before storage and as soon as possible after delivery. In event of suspected concealed damage, ask the driver to wait. Concealed damage must be reported within 1.5 days of receipt.

____If concealed damage is found, stop unpacking the shipment. Do not move damaged material from the receiving location. Take photos of the damage. The owner must provide reasonable evidence that the damage did not occur after delivery.

____Notify the carrier of the damage as soon as possible. Request an immediate joint inspection by the carrier and consignee. A determination of responsibility will be made and the carrier will authorize repairs in the event of admission of fault.

____Notify Paul Mueller Company immediately. We will coordinate repairs.

Accepting Delivery

It is the consignee's responsibility to accept delivery of damaged goods unless permission to refuse delivery has been given by Paul Mueller Company. DO NOT REFUSE DELIVERY of damaged goods without prior authorization. The ownership of the shipment has passed from Paul Mueller Company to the customer at the time of shipment. Refusal of the delivery may impede the recovery of damages.

UNAUTHORIZED REFUSAL OF SHIPMENT WILL RESULT IN A 20% RESTOCKING CHARGE TO THE CUSTOMER. PAUL MUELLER COMPANY IS NOT, AND WILL NOT BE, RESPONSIBLE FOR DAMAGES, OR FOR FILING FREIGHT CARRIER CLAIMS.

Section 2 – Paul Mueller Company Limited Factory Warranty

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STANDARD Warranty: Offered on all models.

General Qualifications for coverage:

1. The chiller has been properly installed according to factory recommendations and acceptable industry standards and local codes.

2. Chiller has been properly field started and commissioned in accordance with factory recommendations.

3. A completed commissioning report (see **Field Commissioning Checklist** found on pages 44,45,46 of this booklet) has been completed, signed and faxed back to Paul Mueller Company.

4. The application of the chiller is one for which it is properly suited and sized.

5. The chiller has NOT experienced freight damage.

6. Customers account must be current. Credit terms for each transaction are stated on your Factory Order Confirmation.

7. Paul Mueller Company may, at its own discretion, require a second opinion for warranty by its own contractor. If an Authorized Paul Mueller Company Service Technician is available, Paul Mueller Company may require the repairs or a post repair inspection to be performed on the equipment at the factory's expense.

8. Activate the warranty by calling Paul Mueller Company at: **417-575-9000**

STANDARD Parts Coverage: For a period of 13 MONTHS from shipment, Paul Mueller Company will exchange a factory installed part for reason of a factory confirmed defect in workmanship or material failure.

STANDARD Parts coverage details:

1. Prior to shipment of a replacement part, customer must issue a PO (or provide Visa / MasterCard information) to Paul Mueller Company. Paul Mueller Company will process billing for the item(s) on a COD or terms basis.

2. ALL warranty exchange parts must be returned to : **Paul Mueller Company,** 1600 W. Phelps St., Springfield, MO 65802 within **30 DAYS** of shipment. Failure to do so, will result in NON-COVERAGE of outstanding items.

3. Prior to return shipping, all item(s) must have a Return Goods Authorization (RGA) number. You must indicate RGA number, as well as, the base unit's Model and Serial number on the return item(s). Failure to do so will delay warranty coverage approval. **IMPORTANT:** It is highly recommend that you retain shipper tracking information for return items.

4. The customer is responsible for all freight charges. Outbound freight charges will be billed to customers open account or charged COD at the time of shipment. All return parts will be shipped to the above address prepaid. **Important: Unless specified in writing to the contrary, all outbound shipments will be considered urgent and will be shipped out next day air.**

5. You will be billed the list price for the replacement part plus applicable shipping charges. Once the original part is received and warranty verified, the customer's account will be credited for the part only. In the event the warranty claim is not valid, the customer will be expected to pay for the part within 15 days from the date of the original invoice.

Section 2 – Paul Mueller Company Limited Factory Warranty *(continued)*

STANDARD Warranty: Offered on all models.
STANDARD Labor Allowance Coverage: For a period of **30 DAYS** from verified commissioning or **45 DAYS** from shipment, whatever is less, Paul Mueller Company will provide labor allowance coverage for reason of a factory confirmed defect in workmanship or material failure repairs. The maximum allowances are provided on the table labeled "**Factory Labor Allowance Chart**" within this booklet.

STANDARD Labor Allowance Coverage Details:

1. In order to qualify for labor allowance coverage, you must have a valid Paul Mueller Company PO# issued prior to starting work on subject chiller. The amount of labor charged must match the amount of the PO allowance.

2. Should additional covered repairs come up during the course of performing an approved repair, technicians must call in for additional authorization as needed after the initial PO has been issued. Failure to do so will result in the return of the unpaid invoice or an invoice short pay.

3. Maximum travel time ROUND TRIP for warranty repairs is **TWO HOURS**.

4. TRUCK charges for warranty repairs are NOT covered under Paul Mueller Company Limited Warranty.

STANDARD Phone Support: Paul Mueller Company will provide TOLL FREE engineering level phone support. Standard support is provided Mondays through Friday from 8:00 AM to 4:30 PM (Eastern Standard Time) excluding major U.S.A holidays. Company engineering support staff (or subcontractors) do NOT warrant support information provided should direct or indirect property damage occur.

STANDARD Compressor Coverage: Paul Mueller Company offers both standard and optional extended compressor warranties on most models of chillers.

STANDARD SCROLL Compressor coverage details: Standard Copeland Scroll Compressor coverage: All Copeland Scroll compressors are warrantied for **12 MONTHS** from date of manufacture at Copeland. Should a compressor of this type fail within the Copeland warranty period, warranty exchange for the compressor must be processed through your **local authorized Copeland reseller**. When contacting your local authorized Copeland reseller, make sure to have the compressors model and serial information available so warranty can be verified.

Standard Copeland SEMI-HERMETIC Compressor coverage: All Copeland Semi-Hermetic compressors are warranted for **12 MONTHS** from date of manufacture at Copeland. Should a compressor of this type fail within the Copeland warranty period, warranty exchange for the compressor must be processed through your local authorized Copeland reseller. When contacting your local authorized Copeland reseller, make sure to have the compressors model and serial information available so warranty can be verified. In some cases, your local Copeland reseller may charge services fees for freight and other service in relation to a compressor exchange. Paul Mueller Company does not cover such charges as part of our Limited warranty.

IMPORTANT INFORMATION PERTAINING TO BOTH SCROLL AND SEMI-HERMETIC COMPRESSORS:
1. Upon writing notice of an in warranty compressor failure please provide Paul Mueller Company with a photo of the compressors data tag showing model and serial number.
2. As part of normal procedure, Paul Mueller Company support may request data from the touch screens portable data drive for review to help determine cause of failure.
3. At Paul Mueller Company's discretion, a teardown may be requested by the compressor manufacture to determine the cause of failure. Failures related to operation outside the compressors design operating envelop will not be covered.

OPTIONAL FOUR YEAR EXTENDED Compressor Warranty Procedure: General Statement:
Extended compressor warranty coverage obligates Paul Mueller Co. to exchange, (FOB) the factory, the compressor with a comparable compressor with equal capacity. Paul Mueller Co., assumes no responsibility for accessories, labor, or freight to or from the factory. Paul Mueller Co. reserves the right to replace in warranty defective parts from its factory. Any unauthorized substitutions of Factory parts voids the Optional Extended Compressor Warranty.
Optional Extended Compressor Warranties must be purchased prior to shipment. Pricing is available
Pricing is available through your Paul Mueller Sales repres

OPTIONAL EXTENDED Compressor Warranty Procedure Details:

1. All extended warranty compressors are processed through the Paul Mueller Co. Factory.
2. To receive an OEM replacement compressor, a PO for the list price of the compressor is to be issued to Paul Mueller Co. and will produce a billing or VISA / MASTERCARD charge for the cost of the compressor plus freight.
3. **Copeland Scroll compressors:** The original Copeland nomenclature sticker from the compressor body must be returned to the Factory within 30 DAYS of the replacement compressor shipment to receive credit.
4. **Copeland Semi-Hermetic compressors:** Must be returned to the factory within 30 DAYS replacement compressor shipment to receive credit. Return compressors are to be shipped pre-paid.
5. Any questions pertaining to Extended Compressors Warranties are to be directed to Customer Service.

IMPORTANT: If your chiller is still within a labor allowance warranty period, you MUST contact Paul Mueller Co. for a labor allowance PO BEFORE starting work. Failure to do so will result in forfeit of labor allowance coverage for the compressor replacement. Paul Mueller Company is not responsible for, direct or indirect, production losses related to a compressor exchange.

IMPORTANT NOTE ABOUT FACTORY INSTALLED FLUID PUMPS: All supplied fluid pumps are hydro tested prior to installation in our chillers. Prior to shipment, pumps are tested a second time for proper operation under full load. For these reasons it is considered rare to find a defective pump at the time of commissioning.

To prevent operational issues with your fluid pumps PLEASE READ:

1. Proper rotation of pumps must be field verified. Running your pump(s) in reverse will cause damage within a short period of time. Such damage is NOT covered under your Standard or Extended warranties.
2. ALWAYS make sure that your chiller, and system, are full of fluid prior to starting your pump(s). Running your pumps dry or with excessive air in the system WILL cause damage to your pump seals. Such damage is NOT covered under your Standard or Extended warranties.
3. The seals provided in your pumps are rated down to 0F entering fluid temperature. If your entering fluid is lower than 0F the pump(s) must run constant otherwise ice crystals can form on pump seals causing damage at the time of re-start. Such damage is NOT covered under your Standard or Extended warranties.
4. Your pump(s) amp draw will increase and decrease in parallel with your flow. At the time your pump(s) were specified it is most likely that your process systems external pressure drop was not known. If your systems external pressure drop is lower than expected, there is a good chance that flow rate through your pump(s) may be in excess of design, resulting in excessive amp draw. If this is the case**, a balance valve located on the pump(s) discharge will need to be throttled back to reduce flow and amp draw. AT NO TIME SHOULD YOU RUN YOUR PUMP(S) OVER THE RATED SF AMPS INDICATED ON YOUR PUMP(S) NOMINCLATURE.** Damage to pump(s) or related control components as a result of running in an over amp condition is NOT covered under your Standard or Extended warranties.

Section 2 – Paul Mueller Company Limited Factory Warranty Continued...

Factory Labor Allowance Chart: This Factory Labor Allowance Chart indicates the maximum labor hours Paul Mueller Company will approve for a specified in warranty repair. For more details on labor coverage, see the preceding section covering "**Labor Allowance Coverage**".

Service Category	Task Description	Man Hours
Electrical	Replace HOST micro-processor controller	1.50
	Replace REMOTE micro-processor controller	1.50
	Replace High or Low pressure controller transducer with cable	1.00
	Replace compressor or fan contactor	0.50
	Replace pump motor contactor/overload and calibrate to SF amps	0.50
	Replace differential flow safety	1.00
	Replace compressor crank case heater (insert or band)	1.00
	Replace receiver heater Scroll system	2.00
	Replace receiver heater Semi-Hermetic system	1.00
	Replace evaporator heater (Brazed Plate)	2.00
	Replace evaporator heater (Shell and Tube)	1.50
	Replace condenser fan motor	0.50
	Replace refrigerant solenoid coil	1.00
	Replace flooded condenser heater controller	1.00
Refrigeration	Replace compressor (Scroll)	6.00
	Replace compressor semi-hermetic	12.00
	Replace TXV standard	3.00
	Replace TXV standard with flooded condenser	2.00
	Replace liquid line solenoid valve standard	3.00
	Replace liquid line solenoid flooded condenser	2.00
	Replace head master valve	3.00
Fluid Systems	Replace Recirculation pump	2.00
	Replace System pump	2.00
	(1) Replace Pump Seal on Recirc or System	2.00
	Replace tank level sight glass lenses	1.00
Leak Repairs	Refrigeration piping braze joint (15% silfos)	2.00
	Fluid piping braze joint (95/5 solder)	2.00
	Pipe to fitting joint repair (Refrigeration or Fluid)	2.00
	Fluid pipe to Braze Plate evaporator	3.00
	Fluid pipe to shell and tube evaporator	5.00
Cosmetic	Repair / replace sheet metal NON DOOR panel	1.50
	Repair / replace sheet metal DOOR panel	1.75
	Secure pipe insulation	1.00
Miscellaneous	Comb condenser fins	0.25
	Allign condenser fan blade	0.25
	Repair condenser fan safety grille	0.25

Section 3 – Machine Labeling

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Nameplates

The chiller nameplate is located on the electrical compartment end of the unit. It contains all the most current and pertinent information about the chiller. In the event of a component change, the nameplate will be the corrected values; the manual may not have been updated yet.

Please refer to this nameplate and provide Paul Mueller Company with the pertinent data when calling for information or parts.

Compressor nameplates are on the compressor housings.

Record your Model Number and Serial Number for easy Reference below:

Model Number

Serial Number

Notes:

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1600 W. Phelps St., Springfield, MO 65802
Phone (toll free): 417-575-9000

e-mail: contact@paulmueller.com
Website: www.paulmueller.com

Model :	
Serial#	

Test Pressure Ratings

REFRIGERATION SIDE	
WATER SIDE	
REFRIGERANT TYPE	
FACTORY CHARGE	

Electrical Requirements

SUPPLY VOLTAGE	
MINIMUM CIRCUIT	
MAXIMUM FUSE	

MOTOR	VOLTS	HZ	PH	HP	LRA	FLA
COMP						
FAN #1						
FAN #2						
PUMP #1						

- OVER CURRENT PROTECTION BY HVACR BREAKER IS RECOMMENDED.
- "SUITABLE FOR OUTDOOR USE"
- UNIT IS NOT FOR USE IN A PRESSURIZED, CLOSED WATER SYSTEM
- CAUTION: SINGLE WALL HEAT EXCHANGER, NOT SUITABLE FOR POTABLE WATER CONNECTIONS.

This equipment contains components that require regular maintenance. Failure to provide maintenance can cause the system to breakdown, or in some cases create unsafe operating conditions. Please consult your equipment operating and maintenance documentation for more information or contact the manufacturer.

Mounting (General information): Units must be installed in a level position, on a firm support. Never use a wooden shipping skid as a permanent base.

Roof top installations: Ensure that the weight with water does not exceed design conditions of roof. If weather patterns in your area produce wind speeds that exceed 30 MPH tie downs are recommended. Always contract with a fully licensed and insured crane operator when such services are needed.

Ground mounted installations: Install the equipment in a location that will provide protection against possible impact damage. When locating the equipment near parking areas it is recommended to install safety barricades around the equipment. This equipment does not come equipped with tamper proof door hinges or fasteners. Be advised that some precautions will need to be taken by the owner of the equipment to prevent tampering that could result in injury or death.

Regardless of where this equipment is to be installed, Paul Mueller Co. recommends that the equipment be securely fastened. It is also recommended to **consult with a qualified structural engineer** when attempting to determine the proper mounting apparatus. The foundation under the chillers must be strong and level. The loaded weight of the storage tank must be considered. Compute the floor load by adding the water storage capacity weight (gals. cap. x 8.3 lbs.) to the shipping weight.

It is recommended that all installations be performed by qualified licensed contractors. This should assure proper installation and operation of the chiller unit.

Compressor mountings: Compressors that are spring mounted, are rigidly secured from the factory to prevent shipping damage. After mounting the unit and prior to commissioning, the following steps should be taken.

1- Loosen and remove the (4) nuts and washers used to hold the compressor firmly in place.

2- Remove and discard the (4) shipping spacers between the compressor and its mounting base.

3- Install the (4) rubber spacers, provided as loose items, over the compressor mounting stud. On all units equipped with Semi-Hermetic compressors, the rubber spacers are wired to the "head-end" of the compressor.

4- Reinstall the (4) nuts and washers removed in step 1 above leaving approximately 1/16” space between the nut and washer. This will allow the compressor to “float” on the mounting springs.

reliable and efficient chiller operation. Please refer to the “Header Sizing” chart for more information.

HEADER SIZING CHART

CHILLER CAPACITY	OPTIMUM HEADER SIZE
2.0 ton - 5.0 ton	1”
7.5 ton - 10.0 Ton	1-1/2”
15.0 Ton	2”

The header size is dependent on three factors:

1. Distance from the pump to the machinery.
2. The size of the pump.
3. The number of the heat exchangers and the flow rate required.

The above recommendations are based on the standard pump furnished with the chiller and a total of 50' of piping. If the distance is greater, it may be necessary to increase the pump, pump impeller, size of the pipes or a suitable combination thereof. It is recommended to keep friction loss of the piping system to a minimum through using as few elbows as possible throughout the piping system.

For best results, Paul Mueller Co. recommends having a qualified mechanical engineer size the piping system. If this information is provided to us at least three weeks before the shipment of the chiller, Paul Mueller Co. can size the pump capacity to the engineered specifications. In the event that the engineering required a larger pump capacity than quoted, a quotation will be issued for the difference.

Notes:

(Things you NEED to know)

All field piping must conform to the requirements of the equipment as well as all applicable national and local codes.

Piping - General: Care has been taken to insure that factory piping are properly braced and all gasketed joints are tight. These may loosen or break during shipment & must be checked as part of start-up. All joints, especially threaded and gasketed joints, should be checked again after one to two weeks of operation. Take corrective action as necessary.

All lines must be supported. The distance between supports will vary with the diameter and wall thickness of the pipe or tubing used, the weight of the fluid being carried, as well as the number of valves and fittings in the line. Supports should be provided near changes in direction, at branch lines and particularly near valves. The weight of the tubing must not be carried through the valves body since this may distort the valve to the point where it will not function properly. Horizontal supports must be close enough to prevent sag which would impose excessive stress. Vertical supports must be close enough to adequately support the weight of the tube as well as to prevent sway caused by blowing wind. As a guide, the following table may be used.

Tube OD - in	3/8 - 7/8	1 1/8	1 3/8 - 1 5/8	2 1/8	2 5/8	3 1/8
Nom pipe size - in		3/4 -1	1-1/4	1-1/2	2	3
Max. span - ft	5	6	7	9	10	12

Chilled Fluid Piping: Various types of pipe may be used, but care must be taken to ensure that the material is compatible with the type of service for which it is intended.

General "good practice" for fluid piping includes:

1. **DO NOT Pressurize the chiller piping with nitrogen or air. Damage to pump seals can occur and void the warranty.**
2. Fluid lines should be kept as short and direct as possible.
3. They should be sized for low pressure drop in order to minimize pump requirements.
4. Lines should be insulated.
5. Use insulation of sufficient thickness to prevent sweating which may damage property or present a hazard to personnel.
6. Piping must be a continuous loop with purge valves or Hoffman automatic air vents installed at high points.
7. Expansion tanks are normally not required and their use is dependent on peculiarities of the job.
8. A continuous and steady fluid flow through the chillers heat exchanger is necessary for proper system operation. If the fluid is being used to cool more than (1) process or machine, bypass circuits may be required.
9. Field supplied flow controls, meters or gauges may be required for proper operation.
10. An installer supplied strainer or filter is rrquired in the return fluid line at the chiller. The fineness of the strainer mesh or the filtering medium used is dependent on local conditions. **Failure to provide a strainer or filter will void all warranties.**

Split condenser systems only

Refrigeration Piping: All packaged chillers leave the factory with the refrigeration side fully piped & charged.

Split systems require interconnecting refrigeration piping between the compressor/evaporator section and the condenser section. Both sections leave the factory charged with refrigerant. Their combined charge is indicated on the compressor/evaporator data tag. Additional refrigerant will have to be added in the field due to the interconnecting piping. The discharge and liquid lines in both sections have shutoff valves with capped service connections. Never uncap these service connections without checking the shutoff valves to be sure that they are fully closed and the units are ready for piping. To prevent moisture in the air from condensing inside the tubes, never leave refrigerant lines open when they are not being worked on, especially overnight. This is especially important with POE oils due to their hydroscopic nature. Copper tubing must be (TYPE L) refrigeration grade (ACR). When using high temperature solders, always pass dry nitrogen through the lines to prevent scaling. Interconnecting line size should never be based on the lead sizes at the compressor/evaporator section and the condenser section.

Notes:

(Things you NEED to know)

Refrigeration Liquid Line - split systems :
1- Liquid lines should be kept as short and direct as possible.

2- They should be sized for low pressure drop to prevent liquid flashing. The height of liquid risers must be taken into account.

3- Do not run liquid lines through heated spaces. At best, this will result in a loss of sub-cooling. At worst, the liquid refrigerant may flash.

4- Do not insulate liquid lines. Liquid refrigerant moving through the line will normally be warmer than the surrounding air. Un-insulated lines will allow for some heat exchange between the refrigerant and ambient air. This increased sub-cooling will result in slightly increased capacities.

5- Brace liquid lines securely to prevent damage to the line due to liquid hammer. Liquid lines have a tendency toward substantial motion when valves are suddenly opened or closed. The bigger & longer the line, the more pronounced the problem. This is caused by the shock of the liquid column impinging on the next closed valve or on the first bend in the line that it encounters and is a major cause of joint failure.

Refrigeration Discharge Line - split systems :
1- Discharge lines should be kept as short and direct as possible.

2- They should be sized for low pressure drop in order to minimize the effect of pressure drop on system capacity.

3- These lines should not be insulated except to prevent injury to personnel who may come in contact with them.

4- Horizontal lines should be pitched downward in the direction of flow to prevent oil from flowing back to the compressor during an off cycle.

5- Vertical lines require a trap at the base of the riser as well as an inverted trap at the top. The inverted trap should be the highest point in the discharge line and should have access valve installed to allow for purging of non condensable from the system. For vertical runs greater than 10-12 ft, additional traps should be used at 10 ft. intervals.

6- Systems using unloading compressors may require the use of double risers.

7- Line pulsation is an inherent characteristic in systems utilizing reciprocating compressors. Additional line support may be required to prevent transmission of vibration & movement in the line.

Compressor Oil Charge: All units leave the factory with POE oil installed to the proper level in the compressor. For Copeland compressors which have an oil sight glass, the proper level is between 1/2 to 3/4 up the sight glass. These levels should be observed at start-up & when the system is operating. Add or remove oil from the system as necessary to maintain these levels. Always remember that too much oil is just as detrimental to a system as not enough.

In the absence of a visible oil leak, low oil level generally indicates one or more of the following problems:

1- Oil was not at the proper level to begin with.

2- Refrigerant lines are not properly pitched. This rarely is a problem with factory piping & is usually encountered with field piping on split systems. The usual causes are:
A- Failure to pitch piping in direction of flow.
B- Excessively large lines which allow refrigerant in velocities to drop below the point where oil is not returned to the compressor crankcase.
C- Failure to provide traps in vertical risers.

3- Low refrigerant mass flow.

4- A system component such as the suction accumulator having a plugged up oil return.

Excessively high oil levels are generally caused by one or more of the following:

1- Oil was not at the proper level to begin with.

2- Oil was simply added to the system due to a low sight-glass without looking for the cause.

Notes:

(Things you NEED to know)

3- A compressor change out using a compressor with a full oil charge. Replacement compressors generally contain no oil or have a reduced charge.

The following oils have been approved by Copeland for use with their compressors.

Mineral Oil:	Witco, Suniso 3GS Texaco, Capella WF32 Witco, Calumet RO15
Polyolester Oil:	Mobile, EAL ARCTIC 22CC ICI, Emkarate RL 32CF

Alkyl benzene's & alkyl benzene/mineral oil mixes are not covered in this manual since their primary purpose is for use with interim refrigerant blends which are not covered.

Leak Testing (Refrigeration Side): Prior to commissioning, the entire system must be leak tested. Due to their greater sensitivity, electronic leak detectors are recommended. Carefully leak test both factory and field made joints including condenser coils. Although each unit is factory leak tested, joints do loosen and sometimes break during shipment.

As with electrical connections, gasketed and flared joints may loosen after a short running time. Approximately 1 to 2 weeks after placing a system into operation, return to again leak check the various joints. Tighten or repair as necessary.

Leak Testing (Chilled Fluid Side): After initially filling the system with WATER ONLY, turn on all pumps & allow the fluid to circulate. The entire system should be checked for leaks, paying special attention to joints and seals. Approximately 1 to 2 weeks after placing a system into operation, return and again leak check the various joints. Tighten or repair as necessary.

If site is going to run glycol, it is advisable to add glycol to the system AFTER chiller and leak checks are performed. If climate conditions exist were running water only for testing can create the potential for freeze, the factory will reimburse customer to repair chiller fluid leaks in accordance to the factory labor allowance chart provided within this booklet.

Important: While initial commissioning and commissioning of your new system(s) is being performed, the system(s) should NEVER be left un-attended while running for at least two hours during first operational test of system.

Evacuation (Refrigeration Side): Evacuating a system to remove moisture and non condensable gases is necessary if it has been opened to the atmosphere. With split systems, provisions should be made to evacuate the interconnecting discharge and liquid lines prior to opening the shutoff valves provided in each section.

Non condensables trapped in the system will increase condensing pressures above what would be normal for a particular operating condition. This causes the system to run inefficiently and may cause nuisance trips on high pressure. Moisture will chemically react with refrigerant and oil in the system creating acids and sludge which in turn will corrode the system internally. This problem can be especially severe with POE oils. Proper evacuation will eliminate these problems.

CAUTION: Do not attempt to use the refrigeration compressor to evacuate the system. Do not start the compressor while in a vacuum.

Connect a deep vacuum pump to both high and low sides of the system with copper tube or vacuum hoses. The larger the tube or hose diameter the better. **In no case** should the inside diameter of the tube or hose be smaller than the vacuum pump's service port. A vacuum gauge capable of showing pressure in microns must be attached. Ordinary charging manifold gauges are not satisfactory! This gauge should be attached to the system as far from the vacuum pump connections as possible. Some gauges of this type may be damaged if exposed to pressures greater than atmospheric. Be sure that the system pressure is below one atmosphere before exposing the gauge to system pressure.

Notes:

(Things you NEED to know)
Manually open all service valves as required. Operate the vacuum pump until a pressure of 500 microns is attained. Close the vacuum pump service valves so as to isolate the pump from the condensing unit and turn it off. Perform a vacuum decay test by monitoring system pressure for approximately 1/2 hour. It should not rise more than 250 microns. Rising pressure indicates either a small leak which was not found during leak testing or moisture in the system.

If a leak is suspected, it must be found and corrected as indicated under leak testing above, **before** proceeding any further. Ultrasonic leak detectors are available which "listen" for the high frequency sound of gas rushing into or out of a system and do not require re-pressurizing the system with a combination of refrigerant and dry nitrogen.

If moisture in the system is the problem, continued evacuation is necessary. Due to the low boiling point of water at very low pressures, freezing of moisture may occur, especially when using a pump of excessive capacity. This can reduce system pressure so rapidly that freezing occurs unless special precautions are taken. These precautions include introducing dry nitrogen into the system to maintain pressure or using sun lamps to maintain temperatures above freezing. Simply running the vacuum pump to rid the system of moisture, once it has frozen, will greatly prolong the evacuation process.

Refrigerant Charging: Once leak testing and evacuation are complete, refrigerant charging may commence. Always refer to the unit nameplate as to the type and amount of refrigerant required.

Always use a charging manifold with gauges along with a scale to charge refrigerant into a system.

When initially charging a system that is in a vacuum, liquid refrigerant can be added directly into the high side while the compressor is off. Never liquid charge into the low side without taking special precautions as indicated further on in this section. As much refrigerant as possible should be charged in this manner since it is the fastest method available. Chilling the receiver (when provided) and warming the refrigerant cylinder will maximize the amount of refrigerant charged. Receivers can be chilled by using either liquid or dry ice packed into a insulating blanket which has been wrapped around the receiver. Refrigerant cylinders can be heated using sun lamps or a warm water bath. Do not use a torch or heat gun since these can cause cylinder pressures to increase significantly in a very short time span.

CAUTION: cylinder pressures must be closely monitored whenever a refrigerant cylinder is being heated in ANY manner. Allowing pressures to exceed those for which the cylinder is rated, may result in the cylinder rupturing with related injury and/or property damage.

Once system and tank pressures have equalized, other slower methods must be employed to finish charging the system. The method chosen depends on the refrigerant involved.

"Pure" refrigerants such as R134A and R22 as well as Azeotropic blends such as R507 can be vapor charged into the low side. Never attempt to vapor charge into the system high side. This will result in the refrigerant cylinder being charged by the system rather than the other way around. Cylinders can quickly be over pressurized causing them to rupture with resultant injury and property damage.

Zeotropic blends such as R404A as well as near Azeotropic blends should generally not be vapor charged due to fractionation. This is the process where the most volatile component(s) in the blend begin to boil first thereby leaving higher concentrations of the least volatile component(s) behind. This does not present a problem if the entire contents of the refrigerant cylinder is to be used since at this point all the refrigerant has boiled off returning the mixture to its original proportions. If all the refrigerant in a cylinder is to be used, vapor charging is permissible although it is probably not a good habit to get into. When in doubt as to the type of blend being used, refer to a current pressure - temperature chart. If the saturated temperature column for a particular refrigerant shows distinctly different bubble and dew points, it is either a zeotrop or near azeotrop. These types of refrigerants should be liquid charged as this process prevents fractionation. Once liquid charging into the high side is complete, start the compressor and begin liquid charging the low side. When doing this, a throttling valve must be used to insure that the liquid flashes to vapor before entering the compressor. Pure refrigerants and azeotrops may also be charged in this manner.

Notes:

Fractionation is a concern with system leaks. The problem is negligible in areas of the system where the refrigerant is in a totally liquid or vapor phase. However if the leak occurs in a heat exchanger where phase changes are normally encountered, the problem can be significant. In these cases, the refrigerant component(s) which are most volatile will be released first leaving behind high concentrations of the least volatile. This will eventually affect system performance to the point where water or glycol temperature cannot be maintained. The effects of fractionation become more significant with increased refrigerant glide. Therefore the problem is more pronounced with zeotrops than with near azeotrops. If leaks are small and corrected early, simply topping off is acceptable. However with systems having repeated or large leakages it may be necessary to completely evacuate and recharge.

The amount of refrigerant required to charge a system depends on the particular components used to make up the system. In addition, the type and combination of head pressure control being used must be considered. No head pressure control or condenser fan control by itself requires no additional refrigerant. Flooding types of head pressure control may require a significant amount of additional refrigerant. The exact amount being dependent on the condenser coil design as well as the minimum head pressures required for proper expansion valve operation. Combining fan control and flooding type controls can significantly reduce the amount of additional refrigerant required.

MSZ / MSZT system charging: As with all our units, the **MSZ / MSZT** split systems come with a full factory charge. After run testing at the factory, valves are closed at the condenser and the chiller unit to hold the factory charge. Once the line set is field installed, tested with a nitrogen holding charge and evacuated to at least 200 microns, the refrigerant holding valves can be opened.

ON ALL MSZ / MSZT SYSTEMS: Additional refrigerant will need to be added to the system to account for the additional liquid line that has been field installed. Please see the table below to determine the additional refrigerant needed:
Notes: 1**.** The number of additional pounds indicated on the table above are per 100 linear feet of pipe. For example: An R-22 system with a 50' x 5/8 OD liquid line will require and additional 5.9 lbs of refrigerant (11.8 / 2 = 5.9). 2. On dual stage systems the amounts below are per ckt.

LLTube OD	3/8	1/2	5/8	7/8	1-1/8	1-3/8	1-5/8
R22 /lbs	3.9	7.4	11.8	24.4	41.6	63.5	90
R404A /lbs	3.4	6.4	10.3	21.2	36.1	55	78

MSZ / MSZT with flooded condenser control for low ambient operation

Some applications require additional protection from low (0F)to very low (-30F) ambient conditions. In these cases, a flooded condenser control with a refrigerant receiver would be recommended.

Flooded condenser control operation: At approximately 180 PSI, the flooded condenser valve will begin to reduce the normal flow of refrigerant from the condenser outlet to the receiver causing liquid refrigerant to backup into the condenser coil. This process increases the amount of liquid in the condenser coils and reduces the vapor area. The net result of this is a reduction in the amount of coil surface area available to condense compressor gas thus increasing compressor head pressure.

To achieve effective flooded condenser control there MUST BE an adequate volume of refrigerant in the system. In event that there is not enough refrigerant volume in the system, the receiver will most likely be starved causing bubbling at the TXV inlet. This condition will cause abnormally low suction pressures and will result in intermittent (usually and night) low pressure lockout of the micro processor.

Flooded condenser charging procedure:

*** It is always best to perform these steps when the ambient is as close to 70F as possible.

Step #1: Load in the additional refrigerant required for the length and OD size of your liquid line. If not, this must be done before continuing.

Note: For refrigerants other than R22 use the following multipliers to determine the 100% flooding charge.

R134A	1.01
R404A/R507	.89

Step #2: In order to continue to the next step, all compressors with un-loaders need to be set for full load and hotgas bypass valve coil ckts need to be disconnected. Failure to do so can result in gross errors.

Step #3: Locate the table in the back of this booklet with the title "Appendix One" figure 1.

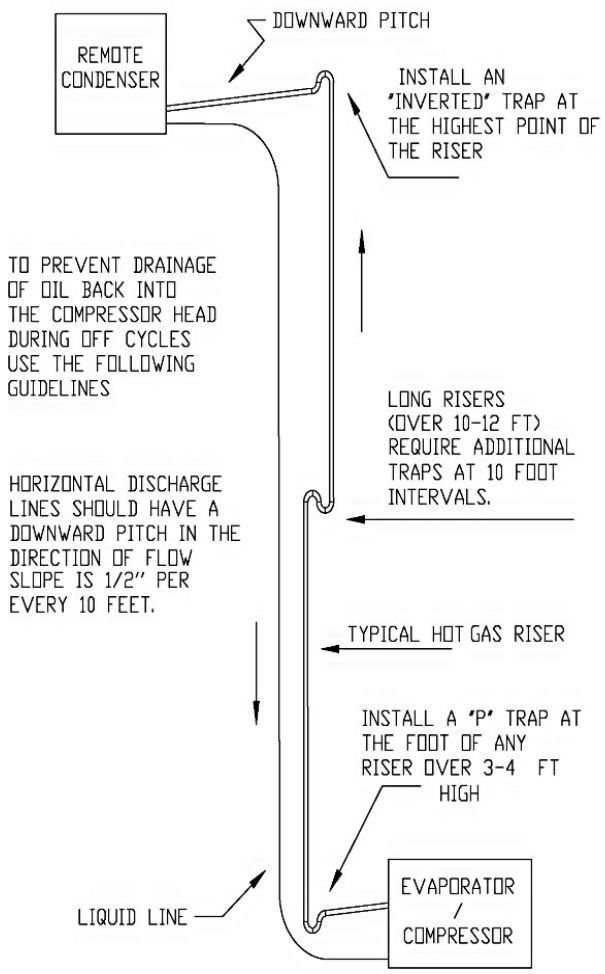
1. Determine your "System Evaporating Temperature F.": On tank model chillers this will be your design chiller leaving water temperature (LWT) minus 15F. On non-tank model chillers this will be your design chiller leaving water temperature minus 10F. **Example:** An MSZT system with a design LWT of 65F will have a System Evaporating Temperature of 50F.
2. Under "Minimum Ambient Temperature F." locate the desired ambient temperature that this chiller will be operating in.
3. Using the Minimum Ambient Temperature and the System Evaporating Temperature, locate the percentage of total flooded charge in the table.

Step #4: Determine the pounds of refrigerant needed to achieve proper condenser flooding for your conditions by multiplying the percentage from step 4 –3 by the 100% flooded charge you determined in step #2.

Split system line sizing: Installing and sizing the interconnecting piping between the **MSZ / MSZT** chiller and the remote CS condenser is extremely important. Deficiencies can result in considerable capacity reductions as well as potential compressor damage do to poor oil return.

For a basic idea of common piping payout, please an image has been provided to the right >

For recommended remote condenser line sized, please refer to Appendix Two in the back of this booklet.



Rigging: Fork lifts or dollies are required for moving this equipment. When lifting from above, always use sufficiently long spreader bars to avoid lifting damage.

Unit Location (General information): Units must be positioned with sufficient clearance on all sides for proper inspection, maintenance and air flow.

On units with air cooled condensers, care must be taken to ensure an ample supply of fresh, clean air. When installing these units indoors, an intake and exhaust air system capable of handling 1000 CFM per compressor horsepower must be supplied. In all cases, caution must be taken to avoid locating units in restricted spaces where heat build up at the condenser can occur. Locating units so that the air discharge from one blows into the air intake of another must be avoided. Avoid low overhangs which may cause discharge air to be recirculated through the condenser. One condenser height is the minimum distance that the condenser face may be located from a wall or obstruction. When placing (2) units side by side so that the condensers face one another, use twice the tallest condenser height as the minimum distance between units.

On air cooled units located outdoors & intended for year round operation, special attention must be paid to prevailing wind direction during colder weather. Cycling or reducing the speed of the condenser fan as a means of head pressure control can be totally ineffective when wind is blowing through the condenser. This is normally not a problem with optional flooding types of head pressure control.

Failure to follow these instructions will cause the unit to run inefficiently and may cause nuisance trips on various safety controls.

Inside vs. outside installation: Air-cooled condenser chillers require sufficient air volume to maintain design capacity and reliable operation. The chiller works best when installed outside where adequate supply of ambient air is available at all times. If this is not possible, with certain precautions, it can be located inside.

Free air circulation: The space temperature in which the chiller is placed is also an important factor in the capacity and efficiency of the chiller. The ambient air temperature in the space must not exceed 105° F. For each 5° F rise in temperature above 95° F, a loss of approximately 6% capacity will result.
Condenser discharge air must be vented to the outside air space to prevent re-circulation. Installation of sheet metal **direct drive condenser fan motors have not been designed to overcome additional external static pressure that a ducted system would produce**.

There must be a minimum of Ten (10) feet of clearance between the condenser discharge and any permanent overhead structure. There must be a minimum of twelve feet clearance between the condenser discharge and any other air conditioning or refrigeration condenser discharges.

To assure proper condenser air intake, there must be a minimum of four (4) feet clearance around the entire cabinet.

NOTE: Some city codes will require special clearance requirements that may not be consistent with the above factory recommendations. In cases where local code requirements conflict in such a way that it may impact the chiller operation in a negative way, please contact the factory for assistance prior to installation.

Freeze protection: A glycol solution will be needed if freezing is a threat. Consult the section regarding freeze protection in the proceeding pages.

High ambient operation: Air temperatures over 105 ° F will definitely retard performance and cause high head pressures. All Paul Mueller Co. chillers come equipped with an accumulator to help counteract problems that can occur during high ambient operation. Contact us if problems related to high temperature extremes persist.

Notes:

Water header system: A header system is a distribution and circulation piping system. This system is the single most important part of a successful chilled water system. The best, most expensive chiller will not perform if the water delivery system is not properly engineered. We cannot emphasize enough the importance of this aspect of the installation.

The header system consists of a supply header and a return header. They are more than just pipes because they must work as a system to distribute the water flow in equal volume and pressure along their full lengths. To accomplish this task, it is necessary that their size be adequate to avoid any restrictions, and that there be connecting bypass line between them at the opposite end from the chiller.

*** ***Installation of Hoffman #79 (or equal) automatic air vents at high points on the chiller water supply and return headers is highly recommended*** ******

Connections to the equipment*:*

1. **DO NOT REDUCE THE LINE SIZE** below the size of the connection.

2. Put thermometers and ball valves in the lines feeding to each heat exchanger for balancing the flow and future servicing.

3. It is recommended to consult with a qualified mechanical engineer to assist with proper connection, piping installation and pipe sizing.

Water in: This is the warm return header connection. Paul Mueller Co. recommends the installation of an additional external water filter on the “Water in” side of the system. This filter must be sized properly to provide adequate flow at the design system flow rate and pressure. It is also recommended to install a bypass to allow return to the chiller while the external filter is being serviced.

Water out: This is the chilled water supply header connection. Paul Mueller Co. recommends installation of a strainer of filter at the inlet of your process. Although the chiller may be protected by the "Water in" filter recommended above, protecting your process equipment from pipe debris is also a good practice.

inlet side of the chiller that a garden hose can be attached to. The prime process may need to be repeated several times until the pump reaches full pumping capacity.

Wiring (General information):

All field wiring must conform to the requirements of the equipment as well as all applicable national and local codes.

Use only copper conductors that are properly sized to handle the load. Always consult the unit electrical nameplate. Since equipment is continuously being updated, do not rely on catalog information unless it has been verified.

Always refer to the unit electrical nameplate for sizing conductors, disconnects and fusing. Units are factory wired so that a single power source can be brought to the unit. This may not always be the case with non standard units. Consult the wiring diagram affixed to the inside of the control panel door.

Electrical connections have been securely tightened at the factory. They DO loosen during shipment and again during initial periods of operation. All connections should be checked and tightened as necessary prior to commissioning and again after the system has been operating for 1 to 2 weeks. To avoid injury, always disconnect power before conducting tightness checks.

Disconnect switches, either fused or non fused, are optional items when the system is purchased and normally are not factory supplied. They must be field supplied and installed as required by applicable national and local electric codes.

Electrical connection: A separate supply circuit with a fused disconnect is required. The unit is equipped with a terminal block for easy high voltage tie in. It is recommended that a qualified technician perform the installation of the high voltage wiring. Great care must be taken to properly size the conductors and install the various electrical components outside the chiller.

Three phase chillers:
Pumps have been set up for proper rotation during test - check that they are rotating in the proper direction after power connections are completed. If your three phase service uses a "Stinger Leg", this leg of power MUST be connected to the T-2 terminal.

Note– equipment failures due to improper electrical hookup or supply voltage will not be covered by the Paul Mueller Co. factory warranty.

24 volt control system*:* Your unit comes equipped with analogue controls. This system has been designed for simplicity of operation and tested for reliability. Below, is a list of the major control components as well as a brief description of their function in the system:

Low ambient fan controls (optional: The system comes equipped with two independent fan controls. The purpose of this control is to cycle the condenser fans to maintain the high side system pressure between 150 psig, and 275 psig, in cold low ambient conditions.

Primary low ambient control (optional) : An electronic proportional control that responds to compressor discharge pressure. This control is designed to modulate the fan. This device is factory set and should not require field calibration.

Compressor hot gas bypass: This system will be automatically activated 90 seconds from compressor commissioning This device will self regulate based on compressor suction pressure. This device is factory set and should not require field calibration during commissioning UNLESS you are setting this chiller up for glycol operation. If you system requires setup for glycol operation please consult Paul Mueller Company for more information.

Water flow safety switch: This safety control protects the chiller evaporator from rupture in the event of water flow failure. It is VERY important to field verify that the flow switch opens in the event that there is low or no fluid flowing through the chiller systems evaporator. Failure to do so can cause damage to your system that is not covered under the manufactures limited warranty. **Compressor time delay**: The compressor (non-adjustable) time delay is to prevent short cycling and compressor burnout due to continuous starting and stopping for periods of low or no cooling load conditions. **As of November of 2003, the compressor time delay is built into the chillers micro-processor controllers firmware.**

Note: In the event of condenser fan replacement NEVER use a sleeve bearing style fan. We recommend to always use Factory certified replacement parts.

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Notes:

Section 5 –
PRE-START Things to Know

MUELLER

Scroll compressors

The Copeland scroll compressor is uniquely different than normal reciprocating compressors. Their operating characteristics and requirements represent a departure from reciprocating technology.

CAUTION!!

Avoid contact with the top of the compressors during operation; they become very hot and can cause uncomfortable burns.

Proper electrical phasing of the power to the compressor is critical for proper operation and reliability of the scroll.

Correct rotation of the scroll must be established before the chiller is started, the electrical sequence of the power supply must be correct. The compressor motors are internally connected for clockwise rotation with the inlet power supply phased A, B, C.

To confirm phase sequence of A, B, C, use an Associated Research Phase indicator or equivalent**.**

It is highly recommended that a qualified technician make the connections of line power to the chiller.

The scroll compressor is designed to accommodate liquids **(both oil and refrigerant)** and solid particles without causing compressor damage, there are some characteristic noises that differentiate it from those typically associated with a reciprocating compressor. These sounds (described below) are characteristic and do not indicate the compressor is defective.

Low suction pressure at start up: The initial flow rate of the compressor is low due to the low condensing pressure, causing a low differential across the expansion valve, which results in low capacity and suction pressure. The compressor will rattle until the suction pressure climbs and the flow rate is increased.

Flutter at shutdown: When the compressor gas expands and causes the rotation until the check valve closes.

During normal operation there are no unusual noises other than those above.

WARNING!!
DO NOT PUMP DOWN THE SCROLL COMPRESSOR INTO A VACUUM.

Scroll compressors can pull internally low vacuums when the suction side is closed. This may cause the internal fusite terminal to arc resulting in compressor damage or failure. It may also trip the circuit breakers or blow fuses.

Since the scroll compressor does not use suction or discharge valves, it is not necessary to perform a pump down. To hold a vacuum could damage a scroll compressor.

The proper procedure for checking a scroll compressor is:

1. Verify the power input is correct and phased properly.

2. With the compressor running, measure the suction and discharge pressure to see if they fall within the normal operating range of the unit.

3. Check the oil's appearance for discoloration. If the oil is dark and smells burnt, it overheated because *of:*

a. extremely high condensing pressure
b. the motor is burnt out
c. metal flakes indicate mechanical failure

4. Check the acidity of the oil with an acid test kit. A reading exceeding 05 mg OHM/g will verify a motor burnout.

5. Excessive amp draw can be caused by excessive condensing pressure or low power voltage coming to the unit. Discolored oil and vibration could result.

6. Low suction pressure can be caused by a plugged screen on the compressor suction inlet. A plugged screen will cause a low oil condition (measured at the oil charging valve). Rattling sounds, and an open winding thermostat could also result. Low load will also cause low suction pressure.

7. Excessive vibration and/or loss of pressure differential usually indicate mechanical failure.

8. Reversed phase rotation will cause:
- Low current draw
- Suction and discharge pressures nearly the same.
- Rattling sound**.**

Reversed rotation for 15 to 30 minutes will result in the motor windings overheating. In which case, the motor winding thermostats will open. This will result in the compressor stopping. Continued reverse operation of a scroll compressor WILL cause eventual compressor failure. Such failures are NOT covered under the manufactures limited warranty.

Compressor motor winding thermostat: Each motor winding thermostat is a pilot duty designed to stop the compressor operation. The winding becomes hot due to rapid cycling, loss of charge, extremely low suction temperature, or reverse phase rotation.

Section 6 – START-UP Things to Know

PLEASE REVIEW THE FOLLOWING INFORMATION BEFORE TURNING THE EQUIPMENT POWER ON.

1. **Technical Qualifications: DO NOT ATTEMPT COMMISSIONING ON YOUR CHILLER UNLESS YOU HAVE BEEN PROPERLY TRAINED TO DO SO.** Paul Mueller Company provides fee based Factory Commissioning Services. For more information you should review the information provided within this booklet or consult with your Paul Mueller Company sales representative.
2. **Commissioning Checklist**: Within this booklet you will find a commissioning check list that must be followed. If you have ANY questions contact Paul Mueller Company Support before you begin.
3. **Compressor oil levels:** If your chillers compressor is equipped with a crankcase oil sight glass make sure to check it. The compressor oil is at the proper level in the oil sight glass (when provided) for the compressor being used. For Copeland compressors, the oil should be between 1/2 to 3/4 up the sight glass. Once your compressor has been started it is very important to monitor compressor oil levels.
4. **Compressor shipping spacers (Semi-Hermetic only):** Shipping spacers on spring mounted compressors have been removed, the neoprene washers used to properly center the compressor foot on its mounting spring & stud have been properly installed & the mounting nut & washer are reinstalled to allow the compressor to “float”.
5. **Compressor crankcase warm-up**: If you are starting your chiller in ambient temperatures below 40F, you must leave the power on and micro-processor off for a least FOUR HOURS prior to commissioning.
6. **Scroll compressor rotation**: It recommended that you disable your compressors by safely removing fuses or disconnecting the compressors contactor 24v coil wire and checking pump rotation if your chiller is so equipped. If your pumps are turning the correct rotation then your scroll compressor should also be turning in the correct direction. After performing this check if your scroll makes a strange noise you must independently verify proper rotation.
7. **Rotolock connections**: Depending on the type and size of your chiller refrigeration components such as receivers and compressors are connected using rotolock connectors. It is common for such connections to become loose during shipment. Prior to starting your chiller ALL rotolock connections should be check for tightness. IMPORTANT: Make sure to use a backup wrench on stationery side of a rotolock connection. Failure to do so can result in breakage.
8. **Service valves**: Depending on the type and size of your chiller refrigeration components, such as receivers and compressors can be equipped with stem type service valves. In order to ship your chillers the U.S Department of Transportation (DOT) requires that all service valves be shipped in the closed position. As such prior to commissioning all stem service valves must be fully back seated to allow refrigerant to flow through. It is also VERY important to tighten the stem service valve packing once the valve has been back seated. Once back seat has been performed and packing's have been tightened remember to replace and tighten the plastic service cap on the valve.
9. **Fluid leaks**: Your chiller was inspected for fluid leaks prior to shipping. As part of the commissioning process you must inspect your chillers fluid system for leaks.
10. **Refrigerant leaks**: Your chiller was inspected for refrigerant leaks prior to shipping. As part of the commissioning process you must also inspect your chillers refrigeration system for leaks. Paul Mueller Company recommends the use of soap bubbles or an electronic leak
11. etector.
12. **Monitoring the chiller during commissioning**: NEVER leave your chiller running unattended during
12. ommissioning.
13. **Adjustment of controls**: The following adjustable controls and valves must be checked with an appropriate gauge and/or thermometer. Many are optional items which may not be included in your system.

    - Condenser Fan Set Points
    - Heat Tape Freeze Protection Thermostat
    - Low Pressure Freeze Points
    - Discharge Bypass Valve
    - Head Pressure Control Valves
    - Thermostatic Expansion Valves
    - Water Regulating Valve

13.
14. **Operational Check:** Once the system has operated for 2 or 3 hours without any sign of problems, it may be left operating overnight. The following day, recheck the system as follows:

    - Check both high and low side pressures. If they are not within appropriate ranges, determine the cause and correct.
    - Check sight glass for signs that additional refrigerant is required. Before adding any refrigerant, leak check the entire system correcting any leaks that may be found.
    - Check compressor oil level where appropriate. Add or remove oil as necessary.
    - Check evaporator superheat and readjust expansion valve as required.

15. **Power checks**: Check voltage and amperage at the compressor power terminals. Voltage must be within ±10% of the nominal as indicated on the unit nameplate. If it is outside of this limit, contact the local power company. If amperage is excessive, the cause must be determined and corrective action taken. With a three phase line, the load must be balanced at each phase.

16. **Safety checks:** Check all safety and operating controls for proper operation.

17. **Low ambient controls:** Check all head pressure controls for proper operation. This may not be possible during warm weather and it will be necessary to wait until ambient falls below 70°F.

18. **Transformer's:** The control circuit transformer is used to step down the system voltage to 24 VAC used to power the control circuit. Additional transformers may be used to power selected components as shown on the wiring diagram. Systems intended for use on 208-230V electric service, the transformer leaves the factory wired for 230V on the primary side. Some transformers must be rewired when used on a 208V network. Always check the wiring of the transformer primary circuit before energizing.

19. **Water Flow Switch:** A safety device used to sense flow through the heat exchanger. It will shut down all refrigeration if flow rates drop for any reason.

20. **Discharge Bypass Valve:** A modulating control valve which opens on a decrease in suction pressure and can be set to automatically maintain a desired minimum vaporating pressure regardless of the evaporator load. The valves normally used have an adjustment range of 0 - 80 psig. Other ranges are available and may be used depending on application. The valve is factory set to maintain a minimum evaporating temperature of 34°F for most applications. Do not reset to a lower pressure when chilling ordinary water unless specially designed heat exchangers are used. For applications using glycol solutions, this valve can be safely reset to maintain a lower minimum pressure. The exact setting will be dependent on the type and concentration of glycol used. To reset the valve, the following procedure should be followed.

A- Remove the cap and insert a 5/16 allen wrench into the adjusting screw. Turning this screw clockwise will increase the setting and counter clockwise will lower the setting.

B- A high evaporator load is initially required to raise the evaporator pressure above the desired setting.

C- Slowly decrease the load until the regulating valve begins to open. A hissing sound and/or an accompanying temperature rise at the outlet connection will indicate that the valve has opened.

D- Note the evaporator pressure when the valve opens. This is the current pressure setting of the valve.

through 21D to determine the new valve setting.

F- Repeat this procedure until the valve is set at the proper pressure for the service required.

21. **Head Pressure Control Valve - adjustable**: This system uses a combination of Sporlan ORD/ORI valves. The ORD/ORI valve is adjustable over a range of 65 to 225 psig and is located in the liquid line between the condenser and receiver. Due to its wide adjusting range, it can be used with most commonly used refrigerants. The valve will throttle and restrict the flow of liquid refrigerant from the condenser. This causes liquid refrigerant to back up in the condenser, reducing active condenser surface and raising the condensing pressure. Adjusting the valve is done by removing the cover over the adjusting screw and turning it clockwise to raise pressure and counter clockwise to reduce pressure. The ORD valve is a non adjustable pressure differential check valve located in a bypass line between the systems discharge line and the receiver inlet. As the ORI valve restricts flow from the condenser, it creates a pressure differential across the ORD valve. This allows the ORD valve to bypass hot gas directly into the receiver, warming the liquid refrigerant and thereby maintaining a constant pressure at the expansion valve.

Head Pressure Control Valve - non adjustable: This system uses a Sporlan OROA valve which is factory set to maintain 225 psig discharge pressure with R22, R404A and R507. The valve used with R134A is set to maintain 100 psig. It does this by limiting the flow of liquid refrigerant from the condenser, thus flooding it, while regulating the flow of hot gas around the condenser to the receiver to maintain a constant pressure at the expansion valve.

22. **Thermostatic Expansion Valve:** A modulating valve used to meter refrigerant into the evaporator in response to the imposed load. It does this by maintaining a constant superheat of the refrigerant vapor at the suction outlet of the evaporator. The lower the superheat, the more efficiently the evaporator is operating. From a practical standpoint, we recommend a superheat of 8° -10°F at the evaporator. To adjust superheat, remove nut covering the adjusting stem. Turning the stem clockwise will increase superheat and slightly decrease the valves capacity. Turning the stem counter clockwise has the opposite effect. Keep in mind that superheat cannot be adjusted when the system is in a pull down mode.

23. **Water Regulating Valve**: An optional modulating type valve used with water cooled condensers to maintain a constant head pressure. The valve senses discharge pressure and modulates the flow of water through the condenser in response to this pressure. Turning the adjusting stem on top of the valve will increase or decrease the system's discharge pressure

Section #7 — IDEC Microprocessor Controller
(Shipped on all systems after 4/1/2013

Very Important!

Do not proceed with turning on your chiller until a **qualified technician** has completed the required section of the "**Field Commissioning Checklist"** located on pages 44, 45 & 46 at the back of this booklet. **Failure to follow the recommended commissioning could result in chiller damage, void your factory warranty and/or cause possible injury.**

PRIOR TO COMMISSIONING... YOU MUST ACTIVATE YOUR CHILLER'S WARRANTY. YOU CAN DO THIS BY EMAILING THE "Field Commissioning Checklist": contact@paulmueller.com

When running incoming city power to the chiller, make sure that **high voltage power lines are 10 inches OR MORE from the back of the PLC and HMI as well as the temperature sensors and pressure transducer cable.** High voltage lines within 10 inches of the control hardware can cause intermittent chiller control issues.

Section #7 — IDEC Microprocessor Controller (Home Screen)

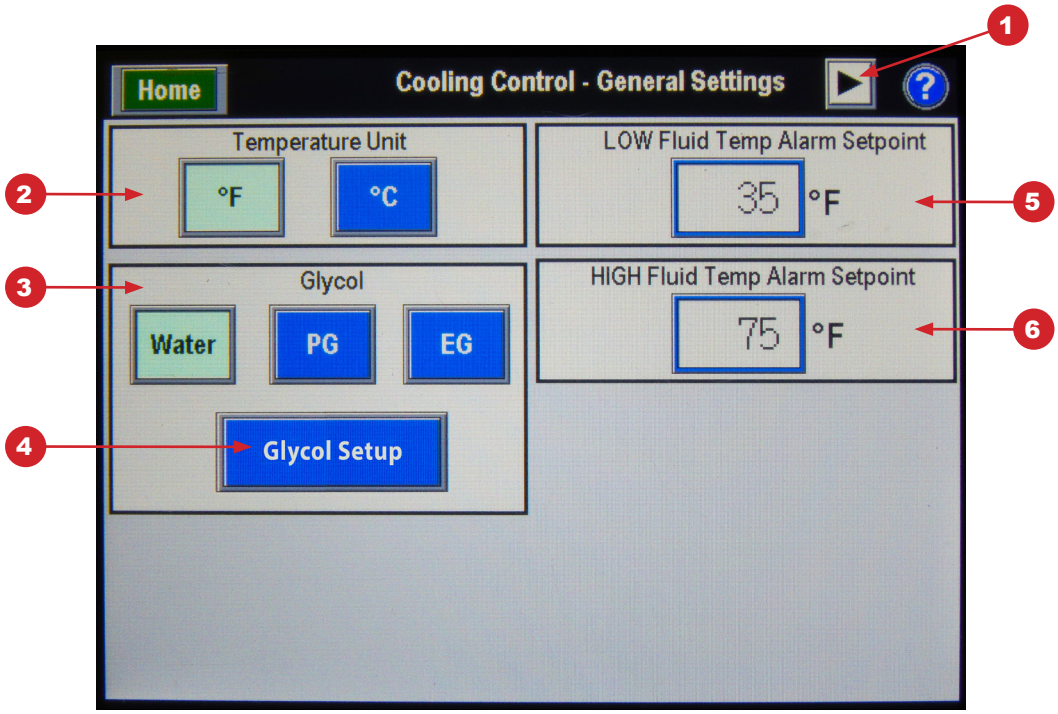
Home Screen Overview

The **Home Screen** displays when your process chiller is first turned on. We have designed this screen to provide the operator with "at a glance" information of the chiller's operational status.

1. **Touch to turn the chiller OFF/ON**.
2. **Help** (button): Press at any time to display help descriptions of the screen controls.
3. Touch to access **Chiller Set points**.
4. Touch to access **Multi Process Pump Control** (if applicable).
5. Touch to access features such as... **Networking, Calendar Setup, Evap & Receiver Heat Temp settings.**
6. Blinks when alarm is triggered. Touch to open Alarm Indication and Reset Function.
7. Touch to display **Fault Alarm Log**. Clears when chiller power is cycled OFF/ON.
8. **Low Flow** (indicator/button); Displays red on low process fluid flow to chiller evaporator.
9. **Low Temp** (indicator/button); Displays red when process fluid has dropped below the low temperature alarm set point.
10. **High Temp** (indicator/button); Displays red when process fluid has risen above the high temperature alarm set point.
11. **Low Pressure** (indicator/button); Displays red when Compressor one (or Compressor two if equipped) suction pressure has fallen below its alarm set point.
12. **High Pressure** (indicator/button); Displays red when Compressor one (or Compressor two if equipped) discharge pressure has risen above it alarm set point.
13. **From Process** (indicator): Displays the fluid temperature (in F or C) returning to the chiller from your process.
14. **To Process** (indicator): Displays the fluid temperature (in F or C) leaving the chiller to your process.
15. **Ambient** (indicator): Displays outdoor ambient temperature (in F or C). Sensor is in the electrical panel.
16. **Displays Red** when the compressor(s) is OFF, and Green when the compressor(s) are calling for cooling and ON. Touch to display compressor discharge and suction pressures.
17. **System Pumps** (multifunction indicator/buttons): Displays the run status of system pumps. Also provides the option to operate the pump(s) in either auto (with lag lead) or manual.
18. **Recirculation Pumps** (multifunction indicator/buttons): Displays the run status of evaporator pump. Also provides the option to operate the pump in either auto or manual.

Cooling Control – Screen Overview

The **Cooling Control Home Screen** is the first of three screens the operator can use to enter important setup data.



1. **Use the Arrow Buttons to move between screens.**

2. **Chiller Fluid Selection:** Touch to select the fluid type that is being used in the chiller. If selecting PG or EG a Glycol Setup will also display below.
3. **Glycol Freeze Protection** (buttons): Operator declaration of the process fluid medium makeup. This information is needed to help protect the chiller from freeze up. Press to select Water, PG, or EG. If selecting PG or EG, a Glycol Setup button is displayed.
4. **Glycol Setup Confirmed Freeze Point Control** (numeric input): Press to set the Confirmed Fluid Freeze Point.* Entering the Fluid Freeze Point will allow you to lower the chiller fluid set point below 44ºF. In order to reduce the possibility of damage related to process fluid freezing, the operator must verify the process fluid freeze point. This can be done by using an optical refractometer.**

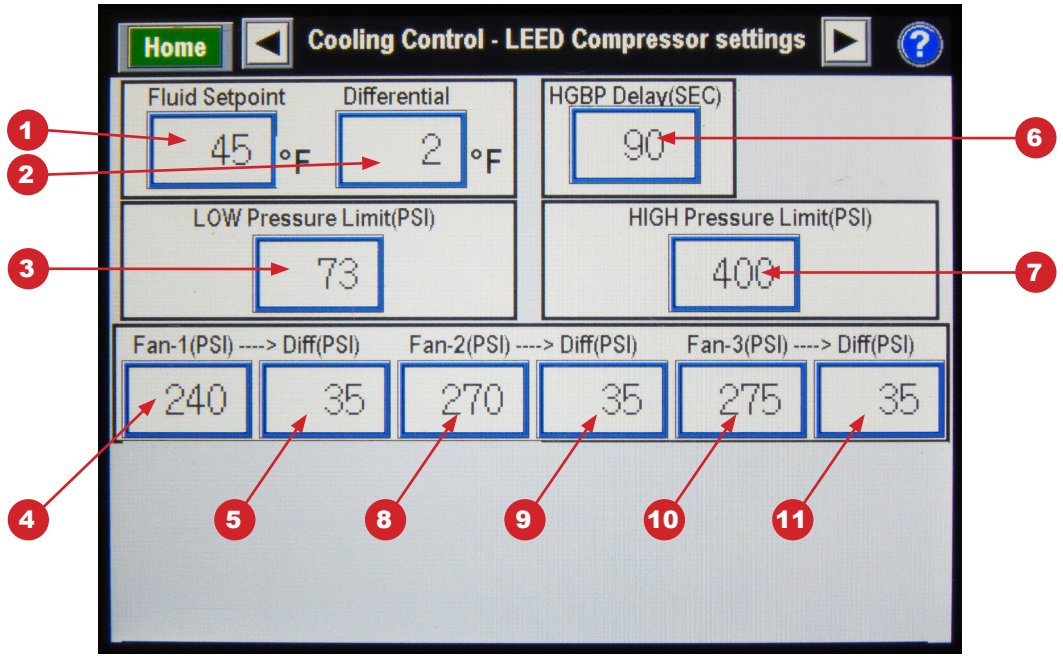
Lowering the freeze point setting below the actual measured freeze point of the fluid may result in evaporator failure causing process fluid and refrigeration circuit contamination... Voiding Any Warranty. Freeze point should be checked periodically.

5. **Low Fluid Temp Alarm Set Point** (numeric input): Touch the box to set the Low Fluid Temp Alarm Set Point. This setting should be 5 degrees lower than your Fluid Set Point. Once the process fluid has fallen below this set point, the Low Fluid Temp Alarm will activate shutting down the chiller.
6. **High Fluid Temp Alarm Set Point** (numeric input): Touch the box to set the High Fluid Temp Alarm Set Point. This alarm is an indicator only. This alarm does not shut down the chiller and will reset once the fluid temperature drops below the set point.

Cooling Control – LEAD Compressor settings – Screen Overview

This screen contains setup information for Compressor #1.

Note: use Arrow buttons to move between screens.



Note: Fan settings are not visible on water cooled condenser chiller models.

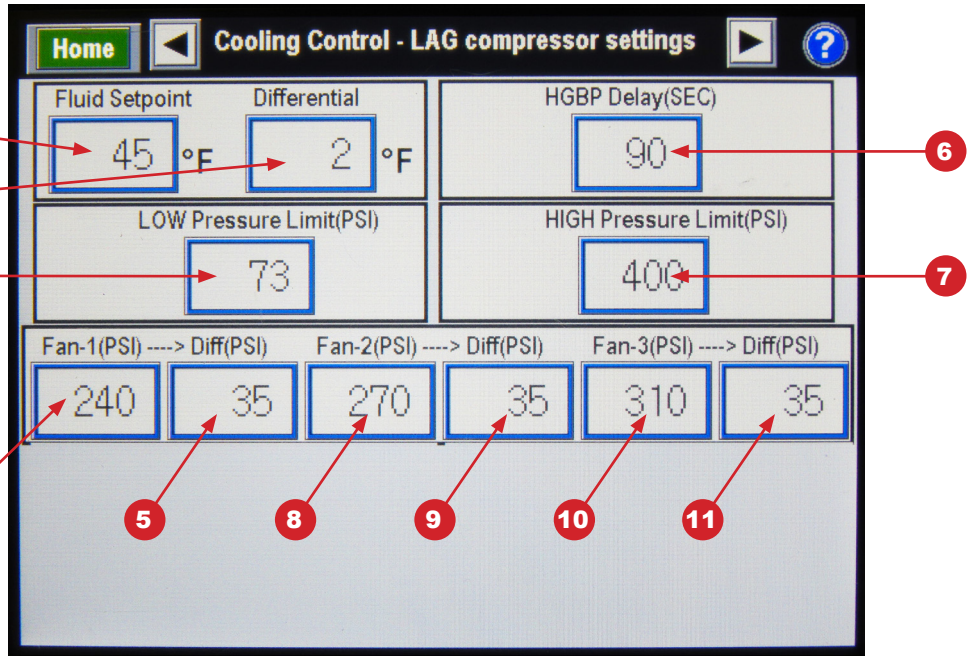
1. **Fluid Setpoint** (numeric input): Process fluid temperature setpoint for compressor one. **Lead** compressor will shut off when the Fluid Setpoint is reached.
2. **Differential** (numeric input): Process fluid differential setpoint for compressor one. Fluid Setpoint (OFF) + Differential = Compressor Start.
3. **Low Pressure Limit** (numeric input): Low refrigerant pressure alarm setpoint (PSI) for **Lead** compressor. Use a TP chart to select the proper Trip-Off pressure setpoint based on refrigerant type to protect the evaporator from Freeze-Up.
4. **Fan-1(PSI)**: Set's the Fan 1 Cycle OFF PSI
5. **Diff(PSI)**: Determines the Fan 1 on PSI - Fan 1 PSI + Differential = Fan 1 ON. Example: 240 Fan 1 PSI + 35 Differential = Fan ON at 275 PSI.
6. **HGBP Delay (SEC)**: Delay in seconds from compressor startup to deployment of the hot gas bypass solenoid valve for compressor one. This should not be adjusted, to allow the suction pressure to stabilize before HGBP Activation.
7. **High Pressure limit** (numeric input): High refrigerant pressure alarms setpoint (PSI) for compressor one. Use a TP chart to select the proper trip-off pressure setpoint based on refrigerant type to protect the compressor from running outside it's operating envelope.
8. **Fan-2(PSI)**: Set's the Fan 2 Cycle OFF PSI
9. **Diff(PSI)** Determines the Fan 2 on PSA - Fan 2 PSI + Differential = Fan 2 ON. Example: 240 Fan 2 PSI + 35 Differential = Fan ON at 275 PSI.
10. **Fan-3(PSI)**: Set's the Fan 3 Cycle OFF PSI
11. **Diff(PSI)**: Determines the Fan 3 on PSI - Fan 3 PSI + Differential = Fan 3 ON. Example: 240 Fan 3 PSI + 35 Differential = Fan ON at 275 PSI.

Note: It is highly recommended not to change the factory settings unless you fully understand how a change will impact the operation of the chiller. Changes without such understanding can cause damage to equipment and/or personal injury.

Cooling Control – LAG Compressor settings – Screen Overview

This screen contains setup information for Compressor #2.

Note: use Arrow buttons to move between screens.



Note: Fan settings are not visible on water cooled condenser chiller models.

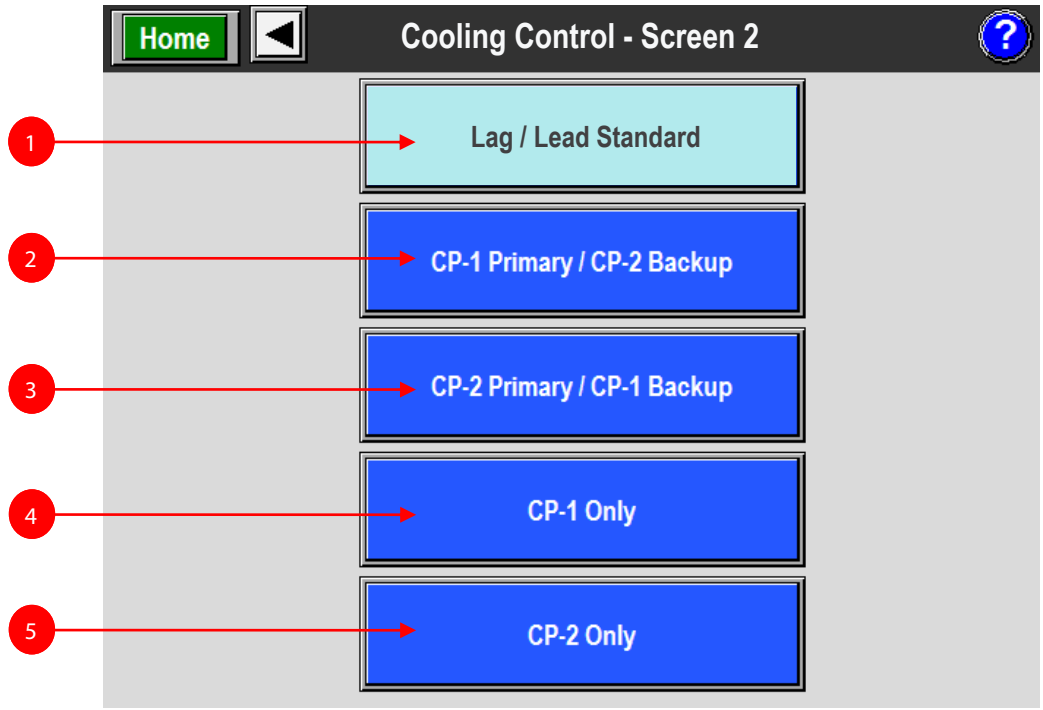
1. **Fluid Setpoint** (numeric input): Process fluid temperature setpoint for compressor two. **Lag** compressor will shut off when the Fluid Setpoint is reached.
2. **Differential** (numeric input): Process fluid differential setpoint for compressor two. Fluid Setpoint (OFF) + Differential = Compressor Start.
3. **Low Pressure Limit** (numeric input): Low refrigerant pressure alarms setpoint (PSI) for **Lag** compressor. Use a TP chart to select the proper Trip-Off pressure setpoint based on refrigerant type to protect the evaporator from Freeze-Up.
4. **Fan-1(PSI)**: Set's the Fan 1 Cycle OFF PSI
5. **Diff(PSI)**: Determines the Fan 1 on PSI - Fan 1 PSI + Differential = Fan 1 ON. Example: 240 Fan 1 PSI + 35 Differential = Fan ON at 275 PSI.
6. **HGBP Delay (SEC)**: Delay in seconds from compressor startup to deployment of the hot gas bypass solenoid valve for compressor one. This should not be adjusted, to allow the suction pressure to stabilize before HGBP Activation.
7. **High Pressure limit** (numeric input): High refrigerant pressure alarms setpoint (PSI) for compressor two. Use a TP chart to select the proper trip-off pressure setpoint based on refrigerant type to protect the compressor from running outside it's operating envelope.
8. **Fan-2(PSI)**: Set's the Fan 2 Cycle OFF PSI
9. **Diff(PSI)** Determines the Fan 2 on PSA - Fan 2 PSI + Differential = Fan 2 ON. Example: 240 Fan 2 PSI + 35 Differential = Fan ON at 275 PSI.
10. **Fan-3(PSI)**: Set's the Fan 3 Cycle OFF PSI
11. **Diff(PSI)**: Determines the Fan 3 on PSI - Fan 3 PSI + Differential = Fan 3 ON. Example: 240 Fan 3 PSI + 35 Differential = Fan ON at 275 PSI.

Note: It is highly recommended not to change the factory settings unless you fully understand how a change will impact the operation of the chiller. Changes without such understanding can cause damage to equipment and/or personal injury.

Cooling Control – Multi-Compressor Settings – Screen Overview

For Multi Compressor Action, this screen displays options to set normal lag lead on compressor run hours or prioritizes which compressor will be lag and lead.

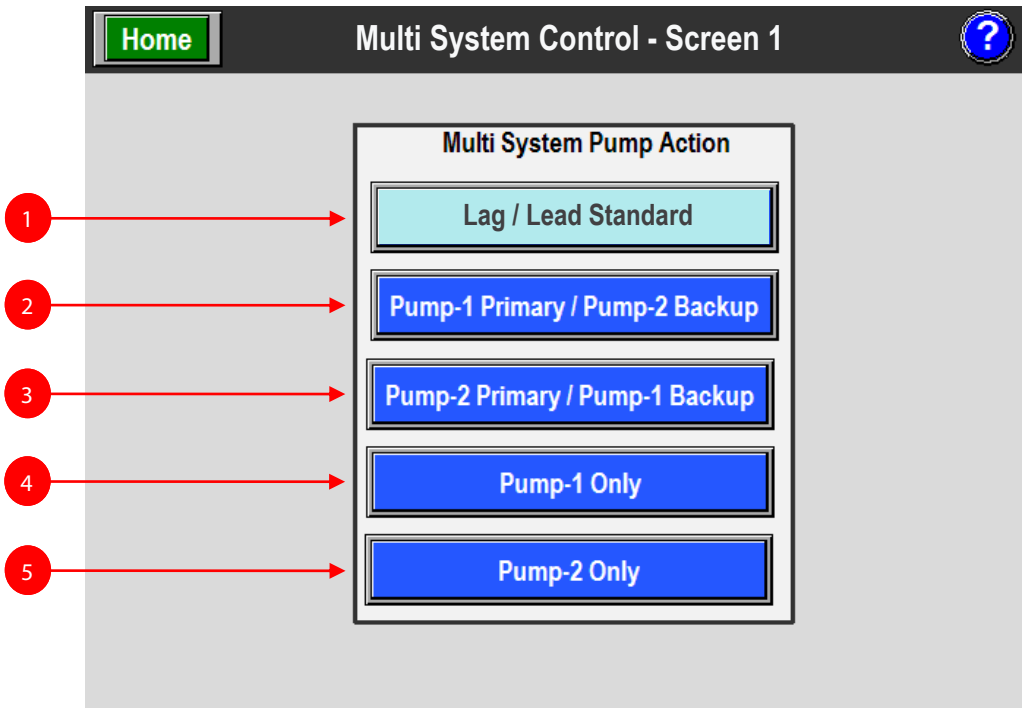
Note: use Arrow buttons to move between screens.



1. **Lag / Lead Standard** (button): Operator declaration of how compressor lag/lead will operate. The compressor's lag/ lead will switch based on compressor run-time hours.
2. **CP-1 Primary / CP-2 Backup** (button): CP-1 will always be the lead compressor, CP-2 will only operate if CP-1 fails.
3. **CP-2 Primary / CP-1 Backup** (button): CP-2 will always be the lead compressor, CP-1 will only operate if CP-1 fails.
4. **CP-1 Only** (button): Locks out CP-2 for service. Ideal for CP-2 service.
5. **CP-2 Only** (button): Locks out CP-1 for service. Ideal for CP-1 service.

Multi-System Pump Control Settings – Screen Overview

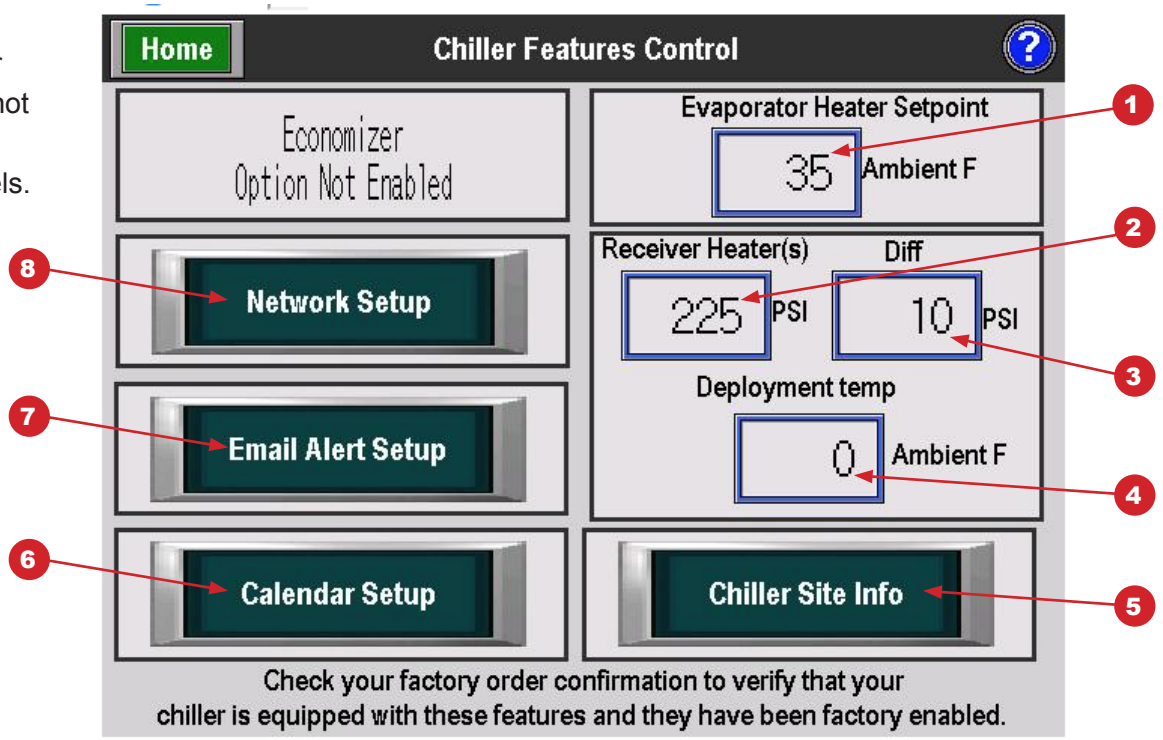
For Multi-System Pump Control, this screen displays options to set normal lag lead on system pump run hours or priorities what pump will be lag and lead.



1. **Lag / Lead Standard** (button): Operator declaration of how system pump lag/lead will operate. The pump's lag/lead will switch based on pump run-time hours.
2. **Pump 1 Primary / Pump 2 Backup** (button): Pump 1 will always be the lead pump, Pump 2 will only operate if Pump 1 fails.
3. **Pump 2 Primary / Pump 1 Backup** (button): Pump 2 will always be the lead pump, Pump 1 will only operate if Pump 2 fails.
4. **Pump 1 Only** (button): Locks out Pump 2 for service. Ideal for Pump 2 service.
5. **Pump 2 Only** (button): Locks out Pump 1 for service. Ideal for Pump 1 service.

Chiller Features Control – Screen Overview

Note: Receiver Heater (optional) settings are not visible on water cooled condenser chiller models.



1. **Evaporator Heater Setpoint** (numeric input): Operator declaration that sets the ambient temperature at which the evaporator heat tape will be turned on.

2. **Receiver Heater(s)** (numeric input): Operator declaration - Sets the minimum compressor head pressure (in PSI) for deployment of receiver heaters on each compressor. Once pressure conditions have been met, ambient temperature must be below Deployment Temperature Setpoint for the Receiver Heaters to operate.

3. **Differential** (numeric input): Operator declaration - Sets the minimum compressor head pressure differential (in PSI) for deployment of receiver heaters on each compressor.

4. **Deployment Temp** (numeric input): Once pressure conditions (above) have been met, ambient temperature must be below Deployment Temperature Setpoint for the Receiver Heaters to operate.

5. **Chiller Site Info**: Use this button to store useful site location information.

6. **Calendar Setup**: Use this button to update the date, time and time zone. (This info is used in data logging)

7. **Email Alert Setup**: Use to enter up to four unique email addresses for chiller alerts. (Must have a moxa switch option installed and chiller connected to your network with internet access.

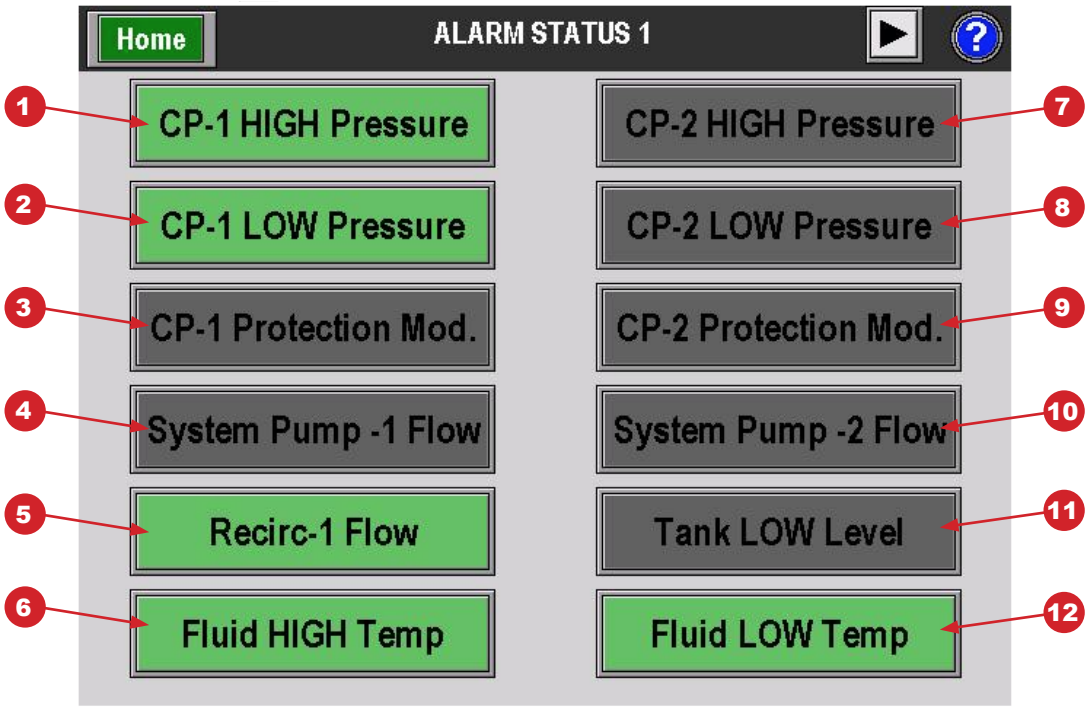
8. **Network Setup**: Use this button to configure the chiller to your network (see network manual for instructions).

Alarm Status 1 of 2 – Screen Overview

This screen provides operator with important chiller status information. Should there be an alarm initiated in one these critical areas, the item will turn from Green (normal) to Red. **These buttons (when pressed) provide the operator with the option to reset the alarm, along with details on the issue and possible corrective actions.**

Note: use Arrow buttons to move between screens.

Note: Alarms can not be reset unless condition is resolved.

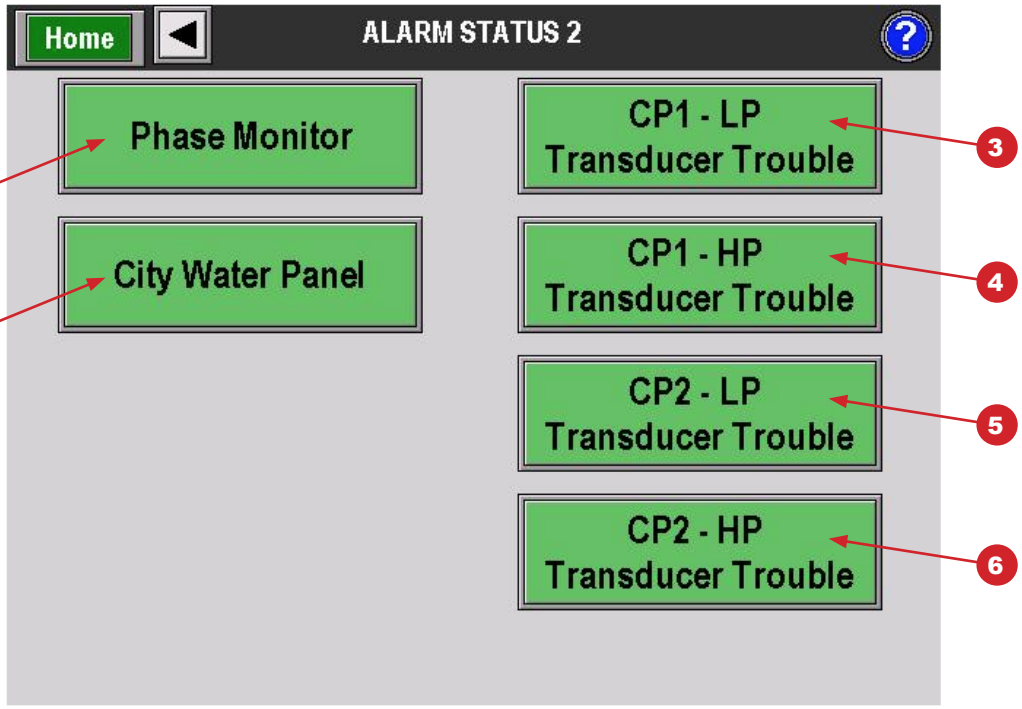


1. **CP-1 High Pressure** (indicator/button): Provides operator detailed information on CP-1 High Pressure alarm item as well as actionable ideas on how to resolve the issue.
2. **CP-1 Low Pressure** (indicator/button): Provides operator detailed information on CP-1 Low Pressure alarm item as well as actionable ideas on how to the resolve the issue.
3. **CP-1 Protection Mod.** (indicator/button): Provides operator detailed information on CP-1 Protection Module alarm item as well as actionable ideas on how to the resolve the issue.
4. **System Pump-1** Flow (indicator/button): Provides operator detailed information on System Pump-1 Flow alarm item as well as actionable ideas on how to resolve the issue.
5. **Recirc-1 Flow** (indicator/button): Provides operator detailed information on Recirc-1 Flow alarm item as well as actionable ideas on how to resolve the issue.
6. **Fluid High Temp** (indicator/button): Provides operator detailed information on Fluid High Temp alarm item as well as actionable ideas on how to resolve the issue.
7. **CP-2 High Pressure** (indicator/button): Provides operator detailed information on CP-2 High Pressure alarm item as well as actionable ideas on how to resolve the issue.
8. **CP-2 Low Pressure** (indicator/button): Provides operator detailed information on CP-2 Low Pressure alarm item as well as actionable ideas on how to resolve the issue.
9. **CP-2 Protection Mod.** (indicator/button): Provides operator detailed information on CP-2 Protection Module alarm item as well as actionable ideas on how to resolve the issue.
10. **System Pump-2 Flow** (indicator/button): Provides operator detailed information on System Pump-2 Flow alarm item as well as actionable ideas on how to resolve the issue.
11. **Tank Low Level** (indicator/button): Provides operator detailed information on Tank Low Level alarm item as well as actionable ideas on how to resolve the issue.
12. **Fluid Low Temp** (indicator/button): Provides operator detailed information on Fluid Low Temp alarm item as well as actionable ideas on how to resolve the issue.

Alarm Status 2 of 2 – Screen Overview

This screen provides operator with important chiller status information. Should there be an alarm initiated in one these critical areas, the item will turn from Green (normal) to Red. **These buttons (when pressed) provide the operator with the option to reset the alarm, along with details on the issue and possible corrective actions.**

Note: use Arrow buttons to move between screens.



1. **Phase Monitor** (indicator/button): Provides operator detailed information on Phase Monitor alarm item as well as actionable ideas on how to resolve the issue.

2. **City Water Panel** (indicator/button): Provides detailed information that the chiller Faulted and is cooling in city water mode. (Clear all chiller faults and reset the city water panel to continue chiller cooling)

3. **CP1 LP Transducer Trouble**: The software is looking for a negative change of 10 PSI in 30 seconds on the suction pressure when the compressor 1 starts. This is to verify the transducer is operational.

4. **CP1 HP Transducer Trouble**: The software is looking for the discharge pressure to rise 10 PSI in 5 seconds when the compressor 1 starts. This is to verify the transducer is operational.

5. **CP2 LP Transducer Trouble**: The software is looking for a negative change of 10 PSI in 30 seconds on the suction pressure when the compressor 2 starts. This is to verify the transducer is operational.

6. **CP2 HP Transducer Trouble**: The software is looking for the discharge pressure to rise 10 PSI in 5 seconds when the compressor 2 starts. This is to verify the transducer is operational.

Alarm	Possible Cause	Corrective Action
CP-1 / CP-2 High Pressure	When compressor discharge pressure exceeds the high pressure safety set point, this fault is expected. This fault locks out the chiller function and shuts down the refrigeration circuit in the event that the high side pressure climbs to unsafe levels. For both air and water cooled condenser systems, this safety is set to 375 psig with R407C, and 400 psig with 404A systems. The fault is cleared by pressing the RED alarm button (on the alarm screen) then pressing the “Reset Alarm Now” button. **NOTE: The PLC will not allow a reset of this alarm while the alarm condition exists. This is a manual reset alarm item meaning mechanical cooling will not reset unless the issue has been resolved.**	Most refrigeration high pressure alarms are directly or indirectly cause by a few items. The two most common cooling mediums are Air (Air Cooled) and Water (Water Cooled). Below, are some common things to check for these system types: **Air Cooled condenser systems (Check for):** 1. Condenser fan operation or rotation 2. Condenser coil restrictions commonly caused by dirt or debris 3. Malfunctioning liquid line solenoid 4. Malfunctioning expansion valve 5. Malfunctioning flooded condenser valve on chiller so equipped. 6. Prevailing winds impacting airflow across condenser coils. 7. Discharge of another air cooled condenser into chillers condenser inlet. 8. Re-circulated condenser air caused by a structure being too close to the condensers discharge air. 9. Ultra high (125F or higher) condenser inlet air temperature. 10 Open condenser fan fuse. **Water Cooled condenser systems (Check for):** 1. Dirty condenser 2. Restricted condenser water flow. 3. Excessive concentration of glycol (20% or higher) in condenser fluid.

Alarm	Possible Cause	Corrective Action
CP-1 / CP-2 Low Pressure	When compressor suction pressure drops below the low pressure safety set point drops to unsafe levels. For both air and water cooled condenser systems, this safety is set to 54 psig with R407C, and 73 psig with 404A systems. The fault is cleared by pressing the RED alarm button (on the alarm screen) then pressing the “Reset Alarm Now” button. **NOTE: The PLC will not allow a reset of this alarm while the alarm condition exists. This is a manual reset alarm item meaning mechanical cooling will not reset unless the issue has been resolved.**	Most refrigeration low pressure alarms are directly or indirectly cause by a few items. Below, are some common things to check for these system types: **Air Cooled condenser systems (Check for):** 1. Restricted evaporator flow rate. 2. Evaporator fowling. 3. Excessive glycol concentration (higher than 20%) in a system that has not been equipped with an upgraded “glycol” evaporator. 4. Plugged filter / strainer on evaporator inlet. Common on chiller with internal tanks with dedicated recirc pumps. 5. Excessive air in the process chiller loop. 6. Low refrigerant charge. NOTE: Do not add refrigerant to a chiller under warranty without factory authorization. 7. Malfunctioning liquid line solenoid. 8. Malfunctioning expansion valve. 9. Malfunctioning flooded condenser valve on chiller so equipped. 10. Moister in the refrigeration system. Note: Check moisture indicator on sight class. Green means dry, yellow means moisture is present. 11. Low condenser inlet temperature. Common on chillers that have not been equipped with flooded or heated flooded options. 12. Excessive refrigerant sub cooling. Caused when flooded condenser receiver are exposed to ambient temps below 0F. Receivers exposed to such low ambient should be equipped with (optional) thermostatically controlled heaters. (continued on next page)

Alarm	Possible Cause	Corrective Action
CP-1 / CP -2 Low Pressure (cont)		**Water Cooled condenser systems (Check for):** 1. Dirty condenser. 2. Restricted condenser water flow. 3. Excessive concentration of glycol (20% or higher) in condenser fluid. 4. Malfunctioning liquid line solenoid. 5. Malfunctioning expansion valve. 6. Moister in the refrigeration system. Note: Check moisture indicator on sight class. Green means dry, yellow means moisture is present. 7. Low condenser inlet temperature. Common on chillers that have not been equipped with flooded or heated flooded options. 8. Excessive refrigerant sub cooling. This can be caused by abnormally low condenser entering fluid temp below about 65F.
CP-1 / CP -2 Protection module	Module safety contacts, located inside the compressor's electrical junction box, have opened causing a Compressor Protection Module error on the chiller's HMI.	With power OFF: 1. Remove the compressors electrical junction box cover. 2. Identify the compressor protection module that is normally marked as such. 3. Check wire connections. 4. Turn power back on and re-check for error on the HMI. NOTE: If fault indicator on HMI persists, make a note of the protection module part number, go to www.jmchillers.com knowledgebase, and perform a search using the module part number. Look for an article that contains the module manufacture troubleshooting procedures.
System Pump 1 or 2 OR Recirc flow	Flow switch on discharge of pump has opened	1. Confirm that associated pump is running. 2. Confirm that associated pump is turning the right direction. 3. Confirm that valves in series with flow switch are open. 4. Confirm filters or strainers in series with flow switch are clean and not restricting fluid flow.

Alarm	Possible Cause	Corrective Action
Tank Low Level	Chillers tank level has dropped below 50% of total tank volume causing associated switch to open.	1. Check tank level. 2. Add fluid. Note: If system is running glycol, freeze point must be confirmed when adding fluid. In most cases, additional glycol will be needed whenever fluid is added to maintain freeze point.
Fluid High Temp	Chiller fluid temp has risen above alarm set point.	1. Check operation of chiller's cooling system. 2. Check chiller's fluid setpoint.
Fluid Low Temp	Chiller fluid temp has fallen below alarm set point.	1. Check operation of chiller's cooling system. 2. Check chiller's fluid setpoint.
Phase Monitor	Settings are incorrect. Voltage inbalance (High/Low). Phase Loss on Main Power Wiring.	Adjust monitor settings to site conditions. Correct Phase Loss on Reversal.
Transducer Trouble	Short cycling. Transducer reading incorrect pressures. Transducer failure.	Verify cooling control settings to prevent short cycle of the compressor. Put gauges on the unit to verify transducer is reading correct pressures. Replace transducer if failure is confirmed.

Section #9 — IDEC Microprocessor Controller Software Update Procedure

Important - please read before continuing with this section:

These instructions require inserting a USB drive into the back of your chiller's HMI Touch Screen while power is on. You should not attempt this unless you understand the potential risks of working inside a live NEMA electric enclosure. Please refer to Page 2 of this document for additional warnings.

Note: Updating the chiller's microprocessor software WILL NOT affect existing settings or data.

Step #1: Contact Paul Mueller Company to Download the newest revision of the Microprocessor Controller Software for the IDEC PLC & HMI.

Step #2: The downloadable software is provided in a ZIP Archive format. After saving the archive to you local computer, Open the archive by right-clicking the file and selecting Extract All, or by double-clicking the file to view the contents. The archive contains three files: HGAUTO.INI, HMI.ZNV, and PLC.ZLD. **Copy and Paste these three files to the Root Directory on your blank USB Drive. DO NOT copy the zip archive file to the USB Drive and DO NOT copy the three files to a folder or sub-folder on the USB Drive.**

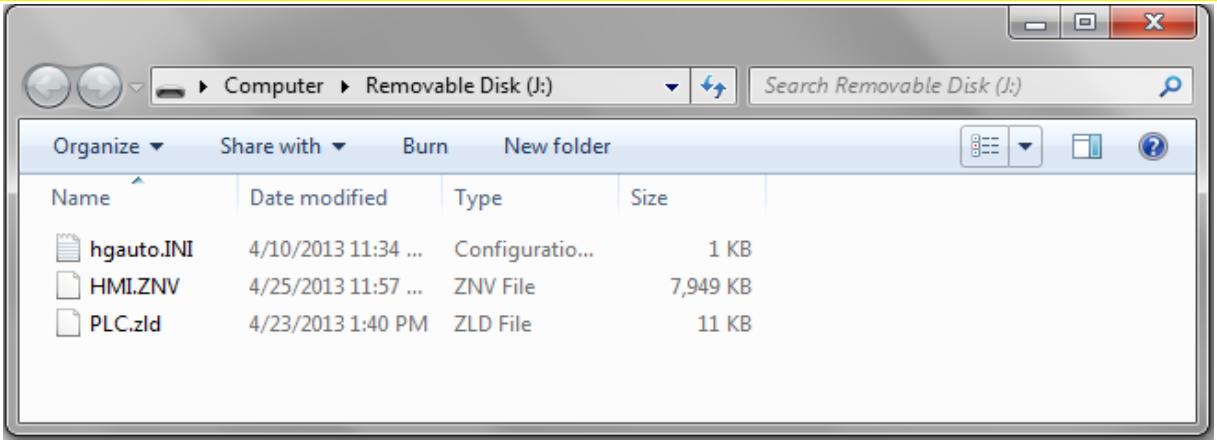


Figure 1

Step #3: If you are replacing hardware, verify that all I/O and power connection to HMI and PLC are correct.

Step #4: If you are replacing hardware, verify that an Ethernet patch cable is installed between the HMI and the PLC.

Step #5: If you are replacing hardware, after all POWER OFF wiring checks have been performed turn on power to chiller. This will bring the PLC and HMI on-line.

Step #6: After power has been turned on, insert the USB Drive into the USB port on the back of the HMI marked "USB2". If you are doing a first time installation of both the HMI and PLC programs, continue with these instructions. If you are re-installing or updating the program files, please proceed to Step #7.

(Continued on next page)

On first time installation when the HMI is turned on you will see the “SYSTEM MODE TOP PAGE” (Figure 2). Within 3-5 seconds of inserting the USB drive in the back of the HMI, the screen will go black for 1-2 seconds then popup the following dialog box (Figure 3).

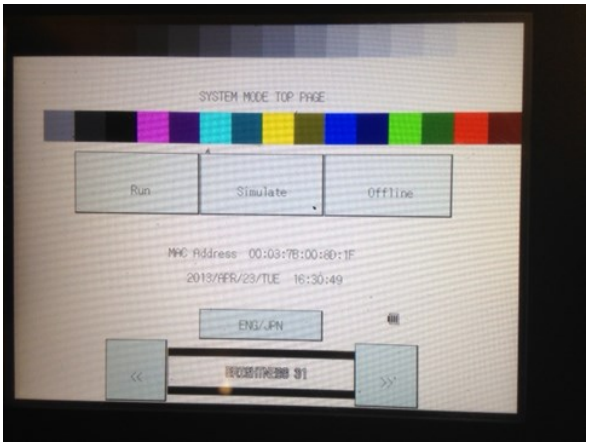


Figure 2

Unlike Step #7, first time programming MUST be done in two steps:

A) Select “DOWNLOAD HMI PROGRAM” first. Once this button is pressed the HMI program will immediately load. This process will take about 90 seconds. Once complete you will get a small confirmation box simply select “ACK”.

B) Next, press the “DOWNLOAD PLC PROGRAM” from the dialog box. This process will only take about 5-10 seconds. Once complete you will get a small confirmation box simply select “ACK”.

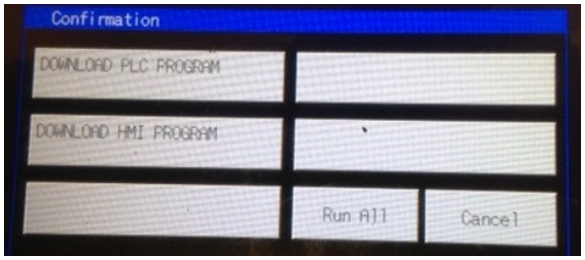


Figure 3

Last steps, press “Cancel” and you will return to the “SYSTEM MODE TOP PAGE” (Figure 2). From this screen press “RUN”. You should see the normal operation screen come up.

Step #7: If you are reinstalling or upgrading the HMI/PLC software simply select “RUN ALL” from the confirmation window (Figure 3) that will appear after inserting the USB drive into the back of the HMI. This process will take about 90 seconds. Once complete you will get a small confirmation box simply select “ACK”.

Note: upon removing the USB Drive from the HMI, the screen will display a message: “Stop the external memory before removing the device”. Press ACK to clear the message.

Section #11 — Freeze Protection

WARNINGS:

1. **TO PREVENT POSSIBLE WATER FREEZE UP OF THE CHILLER EVAPORATOR COIL, DO NOT SET THE TEMPERATURE CONTROL FLUID SETPOINT BELOW 45 F. WITHOUT A MINIMUM OF 30% OF APPROVED GLYCOL AND WATER MIXTURE IN THE WATER SYSTEM.**
2. **AUTOMOTIVE "ANTI-FREEZE" CONTAINS ADDITIVES THAT ARE NOT DESIGNED TO OPERATE WITH A CHILLER. USE OF SUCH PRODUCTS IN YOUR EQUIPMENT WILL DAMAGE COMPONENTS IN YOUR SYSTEM. SUCH DAMAGE IS NOT COVERED UNDER YOUR FACTORY LIMITED WARRANTY.**
3. **GLYCOL OF THE APPRORIATE CONCENTRATION SHOULD BE ADDED TO YOUR CHILLER SYSTEM. WHEN THE CHILLER IS LOCATED OUTDOORS AND EXPOSED TO FREEZING TEMPERATURES.**
4. **PAUL MUELLER CO. CHILLERS ARE TESTED USING WATER. ONCE GLYCOL IS ADDED TO YOUR CHILLER SYSTEM, IT IS MOST LIKELY THAT YOUR CHILLERS SAFETY CONTROLS WILL NEED TO BE UPDATED IN THE FIELD BY A QUALIFIED TECHNICIAN.**
5. **USE OF GLYCOL IN A CHILLER WILL REDUCE ITS CAPACITY. CARE MUST BE TAKEN WHEN SIZING THE CAPACITY OF A CHILLER TO ADEQUATELY COMPENSATE FOR GLYCOL RELATED CAPACITY LOSS.**
6. **ONCE GLYCOL HAS BEEN ADDED AND YOUR CHILLER SETPOINTS HAVE BEEN PROPERLY ADJUSTED TO SAFELY RUN GLYCOL, CARE MUST BE TAKEN WHEN ADDING WATER TO THE PROCESS LOOP. ADDING WATER WILL DILUTE GLYCOL FREEZE PROTECTION. ANY TIME WATER IS ADDED TO A GLYCOL SYSTEM, THE FREEZE POINT OF PROCESS FLUID MUST BE RE-CHECKED. IF FREEZE POINT HAS INCREASED ABOVE DESIREABLE LEVELS, ADDITIONAL GLYCOLS WILL NEED TO BE ADDED TO SYSTEM.**
7. **ALWAYS CONSULT THE GLYCOL MANUFACTURES MSDS, DATASHEETS AND FREEZE TABLES PRIOR TO INSTALLATION.**
8. **ALWAYS CONSULT YOUR LOCAL MUNICIPALITY AS NEEDED TO MAKE SURE THE GLYCOL PRODUCT(S) YOU ARE CONSIDERING USING COMPLY WITH ALL LOCAL CODES AND PRODUCT SAFETY STANDARDS.**

Glycol operation setup: Setting up your chiller to operate properly with glycol can be a challenge. Below, are some basic steps that should be considered.

1. **Adjust Hot Gas Bypass:** If your application requires process fluid to be lower than 45F, you will need to adjust your chillers hot gas bypass system.
2. **Pump flow and amp draw adjustments**: After adding glycol the pump amp draw needs to be re-verified. Pumps should NEVER be operated at amperages in excess of the "SF-AMPS" indicated on pump motors nomenclature sticker. If pump amps do exceed motor SF AMPS rating flow through the pump will need to be reduced.
3. **Optional Adjustable flooded condenser valves (semi-hermetic systems only):** Unlike J&M Scroll compressor model chillers that have fixed flooded condenser valves, all standard Semi-Hermitic equipped chillers come with adjustable valves. If your chiller will be operating in ambient temperatures below 40F outside temperature, adjustment of the flooded valve may be needed to maintain compressor head pressure.
   For optimal performance, adjust the valve to maintain the discharge pressure between 225 and 240 PSI.

Glycol operation setup (continued): Setting up your chiller to operate properly with glycol can be a challenge. Below, are some basic steps that should be considered.

4. **Adjustment to thermal expansion valves** A modulating valve used to meter refrigerant into the evaporator in response to the imposed load. It does this by maintaining a constant superheat of the refrigerant vapor at the suction outlet of the evaporator. The lower the superheat, the more efficiently the evaporator is operating. From a practical standpoint, we recommend a superheat of 8° - 12°F at the evaporator. To adjust superheat, remove nut covering the adjusting stem. Turning the stem clockwise will increase superheat and slightly decrease the valve capacity. Turning the stem counter clockwise has the opposite effect.

IMPORTANT NOTE: DO NOT ATTEMPT TO FIELD ADJUST THE CHILLERS THERMAL EXPANSION UNLESS YOU ARE QUALIFIED TO DO SO. THIS MEANS YOU HAVE A SOLID WORKING KNOWLEDGE OF THE REFRIGERATION CYCLE AND EXTENSIVE EXPERIENCE AT MEASUREING OPERATIONAL SUPERHEAT AND SUBCOOLING. INCORRECT ADJUSTMENT OF A THERMAL EXPANSION VALVE CAN CAUSE SEVERE DAMAGE TO YOUR CHILLERS REFRIGERATION SYSTEM

Under some chiller operating conditions, adjustment to the thermal expansion valve at the time of startup is needed after glycols is introduced to the system.

Volume % ThermalSTAR	Volume % PG - TS	Freeze pt TS degF
0.0	0.0	32.0
5.0	4.8	29.3
10.0	9.6	26.2
15.0	14.3	23.2
20.0	19.1	19.6
25.0	23.9	15.1
30.0	28.7	9.5
35.0	33.4	3.9
40.0	38.2	-4.1
45.0	43.0	-13.6
50.0	47.8	-23.0
55.0	52.5	-36.2
60.0	57.3	-51.9
65.0	62.1	<-60
70.0	66.9	<-60
75.0	71.6	<-60
80.0	76.4	<-60
85.0	81.2	<-60
90.0	86.0	<-60
95.0	90.7	<-60

Section #12 — Periodic Maintenance

Note: for the most up-to-date maintenance information, we recommend that you visit the our website:
www.paulmueller.com

MONTHLY

1. Check for foreign debris in the condenser coil inlets of an air cooled chiller.
2. Visually inspect for water leaks and proper tank level
3. Inspect solder joints for evidence of oil or water leaks.
4. Check electrical connections and components.
5. Listen for excessive vibrations or motor noise.
6. Check system fluid for proper glycol percentage.
7. Check the liquid line sight glass for bubbles.
8. Check the compressor oil level in sight glass if equipped.
9. Check fan and pump rotation for free rotation and correct direction.
10. Check the Y-Strainer if installed and clean out any debris.

OTHER MAINTENANCE ITEMS

These maintenance items are for other Paul Mueller Co. products that may be installed with your package chiller. **These items if applicable should be checked monthly unless otherwise specified below.**

Paul Mueller Co. filter bypass assemblies - Optional:

1. Check system filter housing for cracks.
2. Check system filter housing for leaks.
3. Check filter pressure differential gauge(s). On most filter models, if the differential pressure exceeds 10 PSI, the filter cartridge needs to be replaced. **Contact us at: (417-575-9000) to order a replacement. Make sure to have the filter housing model number available when you call.**

Closed loop fluid testing and treatment

Most chiller systems are initially filled with municipal (main) water as a matter of convenience and overall costs. Although main water may be safe to drink, there is a multitude of bacteria and minerals that, if left un-checked, will cause considerable problems with any closed loop chiller application.

YEARLY

In addition to above:

1. Tighten all electrical connection screws and terminals.
2. Check the glycol solution for cleanliness. Drain and refill with clean solution if excessive sludge or dirt is present. Flush the system prior to refilling.
3. Check motor amp draws and voltage supplies. Make sure they are within name plate rating.
4. Check operating pressures of the refrigeration system.
5. Check super heat and sub cooling.
6. Inspect for leaks with a sensitive electronic leak detector.
7. Check for excess wear or burned contacts on motor starters replace if in doubt.
8. Wash out the condenser coils of an air cooled system.
9. Check the operation of the safety devices and thermostat.
10. Ensure that the pipe insulation is dry and not broken down.
11. Check mechanical mounts and vibration isolators for wear.
12. Remove and clean Flow Switch.

To prevent fluid related problems with you new closed loop chiller equipment, We highly recommends the following:

1. Have the condition of your system fluid checked by a qualified lab, a minimum of four times per year. If your area has a history of water quality related issues, testing may be required more often.
2. Based on the lab results, contract with a qualified company to provide products and services to properly maintain the quality of your closed loop fluid.
3. Create a fluid maintenance log that should contain copies of lab results, MSDS information on products used and notations of the types, amounts and dates chemicals were added to the system.

Here are some of the most common test parameters and the recommended ranges.

Common test parameters	Targets
pH	9.5—10.5
Specific Conductance micromhos, 18º C	3500 or below
Total Iron as Fe, ppm	1 ppm or below
Copper as Cu, ppm	1 ppm or below
Sodium Nitrite as NaN02, ppm	150 ppm max (See note 1)
Molybdenum as Mo, ppm	15—30 ppm
Reserve Alkalinity	(See note 2)

Notes:

1. Reserve alkalinity is a pertinent value only if glycol is used in the loop. If glycol is used in any of your loops, you may want to include glycol in your parameters, but list a recommended value only as operating conditions dictate for proper freeze protection or something similar.
2. Systems shipped after 4/1/13 are equipped with a Magnetic Flow Switch. Fluid quality must be maintained for proper operation. Switch should be removed and cleaned every 24 to 36 months minimum.

Notes:

Appendix One

Minimum Ambient Temperature (F)	Low Temp Chiller					High Temp Chiller				
	System Evaporating Temperature (F)									
	-35	**-25**	**-15**	**-5**	**0**	**10**	**20**	**30**	**40**	**50**
70	62	49	35	15	40	24	0	0	0	0
60	76	65	56	45	60	47	33	17	20	4
40	86	80	74	68	76	68	60	50	52	42
20	90	86	82	78	83	77	72	65	66	59
0	92	89	86	82	87	83	78	73	73	68
-20	94	91	88	86	91	87	82	77	79	73
-40	97	94	92	90	94	89	84	81	79	77

Note: The numbers in the table above are percentages of 100% condenser flooding

Appendix Two

RECOMMENDED REMOTE CONDENSER LINE SIZES

Net Evaporator Capacity BTUs	Total Equivalent Length FEET	R-134a		R-407C		R507 & R-404A	
		Discharge Line (O.D.)	Liquid Line (O.D.)	Discharge Line (O.D.)	Liquid Line (O.D.)	Discharge Line (O.D.)	Liquid Line (O.D.)
3000	50	3/8	3/8	3/8	3/8	3/8	3/8
	100	1/2	3/8	3/8	3/8	3/8	3/8
6000	50	1/2	3/8	3/8	3/8	1/2	3/8
	100	1/2	3/8	1/2	3/8	1/2	3/8
9000	50	5/8	3/8	1/2	3/8	1/2	3/8
	100	5/8	3/8	1/2	3/8	5/8	3/8
12000	50	5/8	3/8	1/2	3/8	1/2	3/8
	100	7/8	3/8	5/8	3/8	5/8	3/8
18000	50	7/8	3/8	1/2	3/8	5/8	3/8
	100	7/8	1/2	5/8	3/8	5/8	1/2
24000	50	7/8	1/2	5/8	3/8	7/8	3/8
	100	7/8	1/2	5/8	1/2	7/8	1/2
36000	50	7/8	1/2	7/8	1/2	7/8	1/2
	100	1 1/8	5/8	7/8	1/2	7/8	1/2
48000	50	1 1/8	1/2	7/8	1/2	7/8	1/2
	100	1 1/8	5/8	7/8	1/2	1 1/8	5/8
60000	50	1 1/8	1/2	7/8	1/2	7/8	1/2
	100	1 3/8	5/8	7/8	5/8	1 1/8	5/8
72000	50	1 1/8	5/8	7/8	1/2	1 1/8	5/8
	100	1 3/8	7/8	1 1/8	5/8	1 1/8	5/8
90000	50	1 3/8	5/8	7/8	5/8	1 1/8	5/8
	100	1 3/8	7/8	1 1/8	5/8	1 3/8	7/8
120000	50	1 3/8	7/8	1 1/8	5/8	1 1/8	5/8
	100	1 5/8	7/8	1 1/8	7/8	1 3/8	7/8
180000	50	1 5/8	7/8	1 3/8	7/8	1 3/8	7/8
	100	2 1/8	1 1/8	1 3/8	7/8	1 5/8	7/8
240000	50	1 5/8	7/8	1 5/8	7/8	1 5/8	7/8
	100	2 1/8	1 1/8	1 5/8	7/8	1 5/8	1 1/8
300000	50	2 1/8	1 1/8	1 5/8	7/8	1 5/8	1 1/8
	100	2 1/8	1 1/8	1 5/8	1 1/8	2 1/8	1 1/8
360000	50	2 1/8	1 1/8	1 5/8	7/8	2 1/8	1 1/8
	100	2 5/8	1 3/8	2 1/8	1 1/8	2 1/8	1 3/8
480000	50	2 1/8	1 1/8	2 1/8	1 1/8	2 1/8	1 1/8
	100	2 5/8	1 3/8	2 1/8	1 1/8	2 1/8	1 3/8
600000	50	2 5/8	1 3/8	2 1/8	1 1/8	2 1/8	1 3/8
	100	3 1/8	1 5/8	2 1/8	1 3/8	2 5/8	1 5/8
720000	50	2 5/8	1 3/8	2 1/8	1 3/8	2 1/8	1 5/8
	100	3 1/8	1 5/8	2 5/8	1 3/8	2 5/8	1 5/8
840000	50	2 5/8	1 3/8	2 1/8	1 3/8	2 5/8	1 5/8
	100	3 1/8	1 5/8	2 5/8	1 5/8	2 5/8	2 1/8
960000	50	3 1/8	1 3/8	2 5/8	1 3/8	2 5/8	1 5/8
	100	3 1/8	2 1/8	2 5/8	1 5/8	3 1/8	2 1/8
1080000	50	3 1/8	1 5/8	2 5/8	1 3/8	2 5/8	2 1/8
	100	3 5/8	2 1/8	2 5/8	1 5/8	3 1/8	2 1/8
1200000	50	3 1/8	1 5/8	2 5/8	1 5/8	2 5/8	2 1/8
	100	3 5/8	2 1/8	3 1/8	1 5/8	3 1/8	2 1/8
1440000	50	3 1/8	1 5/8	2 5/8	1 5/8	3 1/8	2 1/8
	100	3 5/8	2 1/8	3 1/8	2 1/8	3 5/8	2 5/8
1680000	50	3 5/8	2 1/8	2 5/8	1 5/8	3 1/8	2 1/8
	100	4 1/8	2 1/8	3 1/8	2 1/8	3 5/8	2 5/8

Field Commissioning Checklist (PAGE 1)

Please email the completed form to Paul Mueller Company at contact@paulmueller.com as soon as possible. Complete one form for each system being started. Note: This work should only be performed by a qualified service technician who is familiar with such equipment.

Start up date:	Arrival time:
Technicians Name:	Completion time:
Checked in at site with:	Billing PO# if applicable:
Full address of installation site:	

Power OFF system checks	
1. Unit Model:	
2. Unit Serial:	
4. Condenser air clearance (TOP):	Feet:____ Inches:____ Open:_____
5. Condenser air clearance (SIDE):	Feet:____ Inches:____ Open:_____
6. Service access clearance (avg. all sides):	Feet:____ Inches:____ Open:_____
7. Chiller disconnect fuses (check):	Proper size:_____ Tight:_____
8. Chiller main block fuses (check):	Proper size:_____ Tight:_____
9.Check ALL electrical connections (check):	Proper size:_____ Tight:_____
10.Check water connections to chiller (check):	Proper size:_____ Tight:_____
11.Check condenser fan mounting brackets (check):	Proper size:_____ Tight:_____
Power ON <u>compressor OFF</u>	
1. Main power supply voltage and phase:	Volts: _____ Phase:_____
2. Main system pump rotation & RLA:	Rot.OK: __ Rot.Not Ok:__ RLA_____
3. Tank pump rotation & RLA:	Rot OK: __ Rot Not Ok:__ RLA_____
4. Signs of fluid leakage inside the chiller:	

***** Important *****

A. Pumps (Lack of fluid): DO NOT TURN THE CHILLER ON UNTIL THE CHILLER IS FULL OF FLUID. When the equipment is turned on, tank re-circulation pump (PACT models only) will automatically start. Running ANY pump with limited fluid supply WILL cause damage to pumps seals.

B. Pumps (Rotation): Once fluid levels are confirmed, pump rotation must be confirmed. Failure to confirm pump rotation WILL result in pump damage.

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Field Commissioning Checklist (PAGE 2)

Power on <u>compressor OFF</u> (cont..)	
5. With system pump on and running for 30 minutes, clean tank recirc strainer on tank model chillers.	Checked: _____ Clean:_____
6. Check micro processor programming. See page 3-5 of this booklet.	
Power on <u>compressor ON></u>	
1. Ambient temperature:	DEG(F):_____ or DEGC):_____
2. What is current freeze point of fluid?	DEG(F):_____ or DEGC):_____
3. Compressor head pressure:	CKT1(PSI):_____ CKT2(PSI):_____
4. Compressor Suction pressure:	CKT1(PSI):_____ CKT2(PSI):_____
5. Super heat reading:	CKT1(F):_____CKT2(F):_____
6. Compressor RLA:	COMP1: _____COMP2:_____
7. Supply voltage on each leg:	L1:_____ L2:_____ L3:_____
8. Visual check of refer pipe connections for signs of leaks (check one):	Found:_____, None found:_____ Make location of any leaks on right>
9. Checked refer service caps for tightness:	All tight:_____, Tightened:_____
10. Condenser fan rotation & RLA:	Rot.OK:__ Rot.Not Ok:__ RLA:_____
11. Tank temperature control set point	Degrees F:_____ .

***** <u>Important</u> *****

When barrel or tank recirculation pump is stopped, the PLC should indicate "Low-Flo" within 5 seconds. When pump is restarted the "Low-Flo" fault should clear automatically.

If the above does not happen the as described, Check the Harwill flow switch for proper operation.

See supplemental information in this booklet for more information.

Notes:

Important: <u>THREE PHASE COMPRESSORS ONLY</u>: On initial commissioning, if the compressor sounds louder than normal and your suctions and discharge pressures are not within a normal range, there is a high possibility that the compressor is running in reverse. If this is the case, reverse any two legs of power TO THE COMPRESSOR and attempt to restart. RUNNING A SCROLL COMPRESSOR IN REVERSE FOR AN EXTENDED PERIOD OF TIME <u>WILL CAUSE DAMAGE TO THE COMPRESSOR</u>. SUCH DAMAGE IS NOT COVERED UNDER THE MANUFACTURES WARRANTY.

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Field Commissioning Checklist (PAGE 3)

Site information	
1. Unit location (check):	Ground pad:_____ Roof: _____
2. Location of main loop filter (check):	Main loop: _____ Drop:_____
3. Location of main loop bypass:	
4. Type of main loop bypass used (check):	Hand ball valve: ____ Automatic_____
5. Main loop insulation (check):	Insulated:_____ Not insulated:_____
6. Supply pressure at process drop:	PSI:_____ (or) Bar: _____
7. Return pressure at process drop:	PSI:_____ (or) Bar: _____
8. Supply temperature at process drop:	Degrees F:____ (or) Degrees C:_____
9. Return temperature at process drop:	Degrees F:____ (or) Degrees C:_____
10. Flow rate through farthest process drop:	GPM:_____ (or) LPM: _____

Notes:

Technicians Signature:		Customers Signature:	
Printed Technicians name:		Printed Technicians name:	
Date:		Date:	

Notes for Your Records

Paul Mueller Company
1600 W. Phelps St., Springfield, MO 65802

For Factory Replacement Parts Call Us at:

(417) 575-9000

Email: contact@paulmueller.com • **Website:** www.paulmueller.com