FALLING FILM CHILLER

Installation Instructions

Part No. 9843514

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MUELLER
REFRIGERATION PRODUCTS

MUELLER

FALLING FILM CHILLER
Installation Instructions

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SECTION 1.0 – INTRODUCTION

1.1 Model 3 x 5 Standard Features

A. Constructed of Type 304 or 316L stainless steel.

B. Designed for use with R-22, R-134A, R-404A, R-507, or R-717.

C. Required water flow rates:

1. Using high-flow distribution pan:
   Minimum flow rate: 14.7 gpm per plate
   Maximum flow rate: 29.0 gpm per plate

2. Using low-flow distribution pan:
   Minimum flow rate: 9.1 gpm per plate
   Maximum flow rate: 14.3 gpm per plate

3. Using extra-low-flow distribution pan:
   Minimum flow rate: 5.8 gpm per plate
   Maximum flow rate: 8.95 gpm per plate

D. Nominal operating capacity of insulated tank (tankless cabinets are also available):
- 2–8 plates: 173 U.S. gallons
- 2–8 plates, oversized reservoir: 365 U.S. gallons

E. Circulation water connection size:

• 2–8 plates:	Inlet:	Single, extra-low-flow pan, 2″ MPT	Outlet*:	4″ MPT
	Inlet:	Single, low-flow pan, 2″ MPT	Outlet*:	4″ MPT
	Inlet:	Single, high-flow pan, 3″ MPT	Outlet*:	4″ MPT

**Optional 6″, 8″, and 10″ RFSO pipe flanges are also available.*

F. Electronic make-up water solenoid assembly is optional.

G. Hinged and gasketed top doors are available as an option.

H. Clamp-type ferrule and male pipe-thread adapter included for inlet.

I. Falling film chiller expansion valves for each refrigeration plate are available.

J. Refrigeration capacity and refrigerant type must be specified at time of ordering.

1.2 Model 3 x 5 Dimensions

3 x 5 Tankless	Length (in)	Width (in)	Height (in)	Height with Top Door (in)	Weight (lb)	Weight with Top Door (in)
2–8 plate cabinet	70	40.75	46.75	49.25	436	420
Refrigerant plate					64	
Glycol plate					48	
Pan					49	

3 x 5 Tankless	Length (in)	Width (in)	Height (in)	Height with Top Door (in)	Weight (lb)	Weight with Top Door (in)
2–4 plate cabinet	68	24.75	46.75	49.25	354	348
Refrigerant plate					64	
Glycol plate					48	
Pan					33	

3 x 5 with Tank	Length (in)	Width (in)	Height (in)	Height with Top Door (in)	Weight (lb)	Weight with Top Door (in)
2–8 plate cabinet	68.5	39.13	77.13	79.63	770	754
Refrigerant plate					64	
Glycol plate					48	
Pan					49	

3 x 5 Oversized	Length (in)	Width (in)	Height (in)	Height with Top Door (in)	Weight (lb)	Weight with Top Door (in)
2–8 plate cabinet	68.5	39.13	97.13	99.63	837	821
Refrigerant plate					64	
Glycol plate					48	
Pan					49	

1.3 Model 4 x 8 Standard Features

A. Constructed of Type 304 or 316L stainless steel.

B. Designed for use with R-22, R-134A, R-404A, R-507, or R-717.

C. Required water flow rates:

1. Using high-flow distribution pan:
   Minimum flow rate: 31.0 gpm per plate
   Maximum flow rate: 50.2 gpm per plate

2. Using low-flow distribution pan:
   Minimum flow rate: 17.9 gpm per plate
   Maximum flow rate: 28.7 gpm per plate

3. Using extra-low-flow distribution pan:
   Minimum flow rate: 8.3 gpm per plate
   Maximum flow rate: 15.5 gpm per plate

D. Nominal operating capacity of insulated tank:

- 2–8 plates: 293 U.S. gallons
- 9–16 plates: 525 U.S. gallons
- 17–24 plates: 750 U.S. gallons
- 25–32 plates: 1,113 U.S. gallons

NOTE: 2–8, 9–16, and 17–24 plate tankless cabinets are also available.

E. Circulation water connection size:

• 2–8 plates:	Inlet:	Single, extra-low-flow pan, 2″ MPT	Outlet*:	4″ MPT
• 2–8 plates:	Inlet:	Single, extra-low-flow pan, 4″ MPT	Outlet*:	4″ MPT
	Inlet:	Single, low-flow pan, 4″ MPT	Outlet*:	4″ MPT
	Inlet:	Single, high-flow pan, 6″ MPT	Outlet*:	4″ MPT
• 9–16 plates:	Inlet:	Dual, extra-low-flow pan, 4″ MPT	Outlet*:	6″ RFSO pipe flange
	Inlet:	Dual, low-flow pan, 4″ MPT	Outlet*:	6″ RFSO pipe flange
	Inlet:	Dual, high-flow pan, 6″ MPT	Outlet*:	6″ RFSO pipe flange
• 17–24 plates:	Inlet:	Triple, extra-low-flow pan, 4″ MPT	Outlet*:	8″ RFSO pipe flange
	Inlet:	Triple, low-flow pan, 4″ MPT	Outlet*:	8″ RFSO pipe flange
	Inlet:	Triple, high-flow pan, 6″ MPT	Outlet*:	8″ RFSO pipe flange
• 25–32 plates:	Inlet:	Quad, extra-low-flow pan, 4″ MPT	Outlet*:	10″ RFSO pipe flange
	Inlet:	Quad, low-flow pan, 4″ MPT	Outlet*:	10″ RFSO pipe flange
	Inlet:	Quad, high-flow pan, 6″ MPT	Outlet*:	10″ RFSO pipe flange

**Optional 6″ , 8″, and 10″ RFSO pipe flanges are also available.*

F. Electronic make-up water solenoid assembly is optional.

G. Hinged and gasketed top doors are available as an option.

H. Clamp-type ferrule and male pipe-thread adapter included for inlet.

I. Falling film chiller expansion valves for each refrigeration plate are available.

J. Refrigeration capacity and refrigerant type must be specified at time of ordering.

1.4 Model 4 x 8 Dimensions

4 x 8 with Tank	Length (in)	Width (in)	Height (in)	Height with Top Door (in)	Weight (lb)	Weight with Top Door (in)
2–8 plate cabinet	104.38	39.13	90.63	92.88	1,169	1,164
9–16 plate cabinet	104.38	72.38	90.63	92.88	1,621	1,604
17–24 plate cabinet	104.38	105.63	90.63	92.88	2,060	2,035
25–32 plate cabinet	104.38	138.88	90.63	92.88	3,700	3,642
Refrigerant plate					130	
Glycol plate					100	
Pan					100	
4 x 8 Tankless	**Length (in)**	**Width (in)**	**Height (in)**	**Height with Top Door (in)**	**Weight (lb)**	**Weight with Top Door (in)**
2–8 plate cabinet	108.75	41.75	61.44	63.59	787	782
9–16 plate cabinet	108.75	75.88	61.44	63.59	1,041	1,024
17–24 plate cabinet	108.75	109.13	61.44	63.59	1,444	1,419
Refrigerant plate					130	
Glycol plate					100	
Pan					100	

1.5 Plate Design

Paul Mueller Company manufactures plates for the falling film chiller in two basic styles. Figure 1 shows the plate used for direct expansion or recirculated refrigeration systems. Figure 2 shows the plate used for flooded refrigeration systems.

Figure 1: Plate Design for Direct Expansion or Recirculated Refrigeration Systems

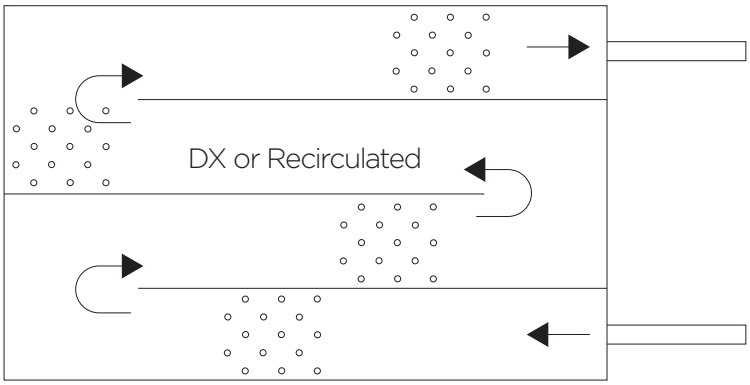
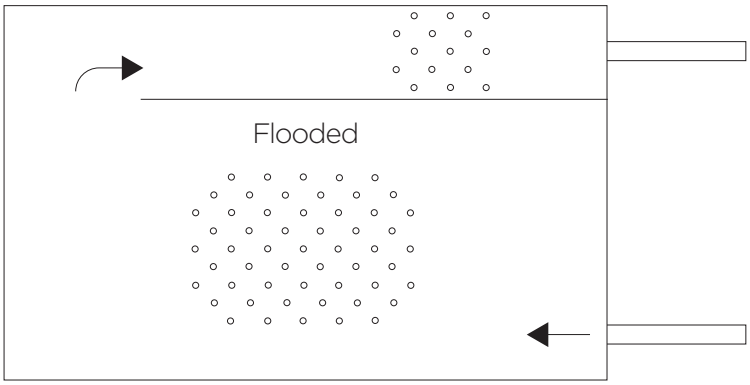


Figure 2: Plate Design for Flooded Refrigeration Systems



1.6 Falling Film Chiller Refrigerant Volumes

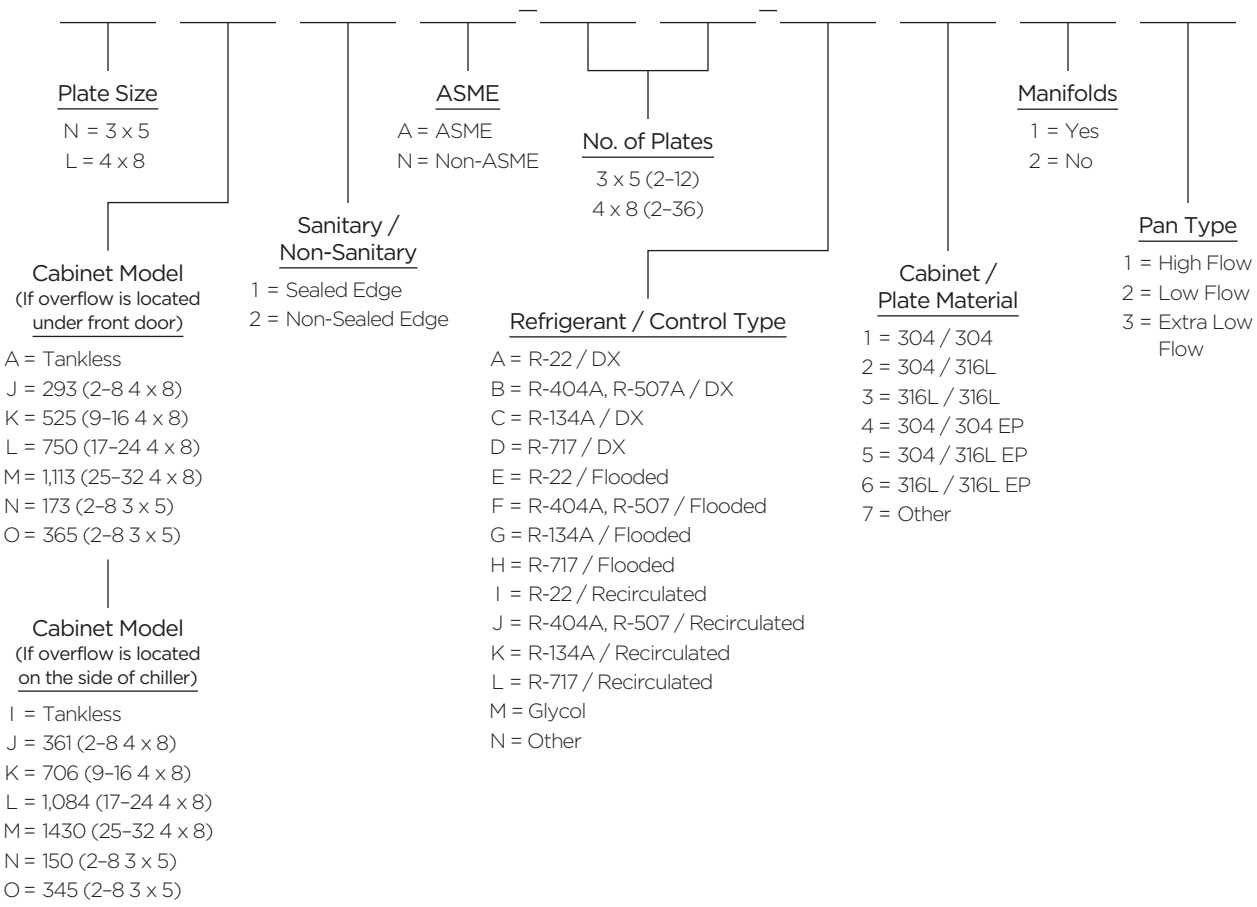
MODEL 3 X 5 No. of Plates	1	2	3	4	5	6	7	8	9	10	11	12
Lbs. of R-22 @ 25°F	12	24	36	48	60	72	84	96	108	120	132	144
Lbs. of R-717 @ 25°F	6	12	18	24	30	36	42	48	54	60	66	72
Lbs. of R-507 @ 25°F	11	22	33	44	55	66	77	88	99	110	121	132

MODEL 4 X 8 No. of Plates	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Lbs. of R-22 @ 25°F	34	68	102	136	170	204	238	272	306	340	374	408	442	476	510	544
Lbs. of R-717 @ 25°F	17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272
Lbs. of R-507 @ 25°F	30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480

MODEL 4 X 8 No. of Plates	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lbs. of R-22 @ 25°F	578	612	646	680	714	748	782	816	850	884	918	952	986	1,020	1,054	1,088
Lbs. of R-717 @ 25°F	289	306	323	340	357	374	391	408	425	442	459	476	493	510	527	544
Lbs. of R-507 @ 25°F	510	540	570	600	630	660	690	720	750	780	810	840	870	900	930	960

The capacities listed above are for the plates ONLY. They do not include any manifolds or piping.

1.7 Model Number Breakdown



SECTION 2.0 – INSTALLATION

2.1 Inspection

It is important to inspect the chiller and parts for any damage when it is received. Note the damage on the bill of lading and file a claim immediately if needed. It is very difficult to obtain claims if the damage is not noted on the bill of lading with the driver's signature.

Open all packages and check against the bill of lading for shortages of parts. This allows you to order them immediately, before actual installation time.

2.2 Location and Leveling the Chiller

A. Location

The chiller should be located in a position as close as practical to the process and to the refrigeration units. A drain should be close by for draining the chiller.

When selecting a location for the Mueller falling film chiller, disassembly for cleaning and the possible future addition of more vertical evaporator plates should be considered. To take full advantage of the chiller's "easy-clean" feature, a 3' clearance should be left on each side of the chiller and a clearance equal to the length of the evaporator plate should be left at the end (opposite refrigeration connections).

B. Leveling

The falling film chiller is equipped with adjustable legs for leveling. The chiller must be level for proper operation of the distribution pan and to maintain an even film flow over the vertical evaporator plates. Leveling also provides for complete drainage of the holding tank.

A carpenter's level placed on the top edge of the distribution pan in both directions or on the top edge of the water storage tank will place the chiller at the proper pitch.

2.3 Obtaining Parts

Before going to the installation site, it will save time if you make a list of parts you need that are not furnished with the chiller. The following is a list you may wish to use as a guide. The quantity, size, and type will vary with each installation.

A. Refrigeration

- Liquid line tubing.
- Suction line tubing.
- Reducers.
- Elbows (if elbows are used, we recommend the long, radius type).
- Refrigerant (R-22, R-404A, R-507, etc.).
- Hangers and brackets to support refrigerant lines or water lines.
- Support stands (if compressors are to be stacked or wall-mounted).
- Insulation: Due to evaporator temperatures, the lines will sweat excessively. It will be necessary to cover refrigerant lines.
- Liquid line solenoid valve (if necessary).

2.3 Obtaining Parts (Continued)

B. Water Lines

- Chilled water line (see Table 2.13 for recommended chilled water line size).
- Adapter, tri-clamp to pipe thread. The 2" is Mueller Part No. 9840758; the 3" is Mueller Part No. 9840759; the 4" Mueller Part No. is 9819684; and the 6" Mueller Part No. is 9841439.
- Fittings: Elbows, tees, unions, valves, adapters, etc.
- Circulating pump.
- Flow switch. Please call for sizing.
- Overflow line, ¾" PVC.
- Propylene glycol will be required if the cooling water is to be operated below 34°F.

2.4 Locating Refrigeration Units

Air flow (for air-cooled condensing units only): There are several factors to consider when locating the refrigeration units; the most important is air flow. Whether located inside or outside, it is absolutely necessary that the condenser have a supply of unrestricted fresh air. When units are located inside, it is very important that the louvers be at least the same dimension as the condensing unit face.

- An exhaust fan or opening large enough to prevent any increase in static pressure must be provided.
- The units must be located so that routine maintenance can be accomplished (cleaning the condensers, replacing the compressors, etc.).
- Avoid areas with machines that would create dust or oil.

2.5 Connecting the Refrigerant Lines

- Do not use tubular fittings that are smaller in diameter than the connections on the condensing unit or a flow restriction will result. Use practical refrigeration practices for refrigerant line sizes.
- Use long radius fittings and do not bend tubing in a manner that will cause it to flatten.
- Always clean and debur all fitting and tubing ends before soldering and purge with nitrogen.
- After soldering is complete, pressurize the tubing and leak test before evacuating and insulating the lines.

SAFETY/ALERT: EPA Statement on hydrochlorofluorocarbon (HCFC): A substance that is released into the environment, HCFC contributes to a serious public health and environmental problem by depleting the ozone layer. Ozone layer depletion increases the risk of skin cancer and other diseases in humans and is harmful to plant and animal life. This equipment shall be serviced and disposed of only in accordance with EPA Section 608 Regulations and the Ozone Depleting Substances Regulation (Clean Environment Act.) N.B.

2.6 Liquid Line Solenoid Valve

The Mueller condensing unit is designed to start and stop based on water temperature. It is not designed as a pump-down system. In some cases it may be necessary to install a liquid line solenoid valve to prevent refrigerant migration during down time. The solenoid should be wired to close upon compressor shut down and open when the compressor restarts. Contact points are provided on the Mueller condensing unit to connect a customer-supplied solenoid valve.

2.7 Water Line Connections

- The water connections on the falling-film chiller will be male pipe thread or tri-clamp fittings with an adapter to male pipe thread.

- A short length of flexible hose must be used between the pump and chiller outlet to prevent damage to the outlet due to vibration.

- We recommend you mount the pump reasonably close to the chiller with a gate-type valve on both the inlet and outlet of the pump so it can be isolated for servicing.

- A flow switch can be installed in the pump discharge line. It should be wired to shut the refrigeration units off and activate an alarm if the cooling solution flow should stop for some reason.

- If the chilled water is to be routed to more than one piece of equipment, a balancing valve must be used to regulate the flow of water to each piece of equipment. It may be more effective to use a second pump for the additional equipment.

- It is recommended to insulate the chilled water lines or they will drip condensate at lower operating temperatures.

- If PVC plastic pipe is used with solutions containing propylene glycol, the manufacturers' of PVC or CPVC pipe recommend that Schedule-80 purple primer and Schedule-80 gray adhesive be used. The following procedure should be used to assemble PVC or CPVC:

    a. Scour primer into the surface with a hard bristle brush. It should be alternately applied to the surface of the pipe once and to the fitting socket twice.

    b Solvent cement should be applied with a hard bristle brush while the primer is wet. It should be alternately applied to the surface of the pipe twice and to the fitting socket once.

IMPORTANT: Galvanized pipe should not be used for applications with propylene glycol, as propylene glycol can strip the zinc coating from galvanized pipe.

2.8 Make-Up Water Valve

An optional water make-up valve is available (see separate instructions).

There may be an increase in volume due to condensation if the unit is operated without the splash covers in place or if the unit is operated with chilled water at very low temperatures.

2.9 Connecting the Overflow Line

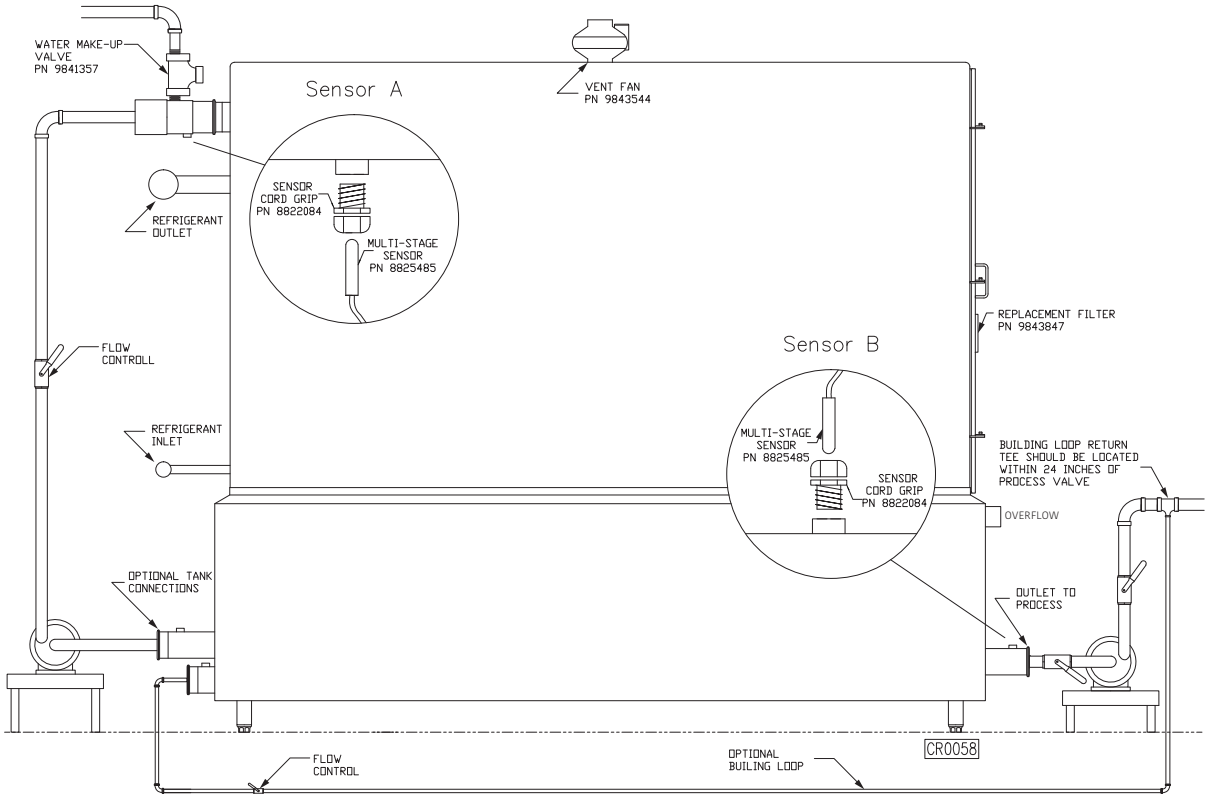
This line should be installed with PVC pipe and must have a continuous pitch to the drain, as any trapping may prevent drainage of this line.

2.10 Mueller Multi-Stage Cooling Control

If you purchased the Mueller multi-stage cooling and pump control, please reference the multi-stage manual for install and setup procedures.

A crucial step in the installation of the multi-stage is the location of the temperature sensors. A rise in water temperature inside the chiller's distribution pan is going to turn on Stage 1 and the condensing unit. The most efficient way to accomplish this is sense the temperature entering the pan. Sensor A should be installed in the ½" FPT port between the water make-up valve and the chiller distribution pan connection. See Figure 3, "Temperature Sensors." Sensor B should be located in the ½" FPT port on the process pump connection under the chiller door. Sensor B is use for only referencing the temperature inside the chiller reservoir.

Figure 3: Temperature Sensors



2.11 Setting Chiller Recirculation Flow and Water Make-Up Flow

After your temperature and pump controls are installed it is time to set the water flows. The flows are important for several reasons. When the two flows meet in the chiller's distribution pan they create the blended temperature that was used to size the chiller. If the blend temperature is not correct, the chiller will not operate properly. The two flows account for a depth of water inside the chiller's distribution pan that directly affects the speed at which the water will flow down the evaporator plates. The idea behind the falling film chiller is that when the chiller calls for make-up water, the sensor sees the rise in temperature as the water enters the pan. Immediately the refrigeration unit turns on, cooling the water down to the designed temperature in one pass across the evaporator plates. These flows can be regulated by flow control setters or a manual valve that can be set and maintain the set position. For inches of water in the distribution pan versus flows, please see Section 2.10 or call Paul Mueller Company Refrigeration Products Service Department at 1-800-683-5537.

2.12 Distribution Pan Water Flow Rates

Distribution Pan Description	Plate Size	Water Flow Rate (GPM) Per Plate vs. Height of Water in Pan															
		1″	1.25″	1.5″	1.75″	2″	2.25″	2.5″	2.75″	3″	3.25″	3.5″	3.75″	4″	4.25″	4.5″	4.75″
High Flow	3′ x 5′	14.7	17.8	19.8	21.1	22.3	23.5	24.6	25.5	26.3	27.4	28.2	29				
Low Flow	3′ x 5′		9.1	9.9	10.7	11.3	11.9	12.5	12.9	13.5	13.9	14.3					
Extra Low Flow	3′ x 5′			5.8	6.4	6.75	7.2	7.45	7.8	8.15	8.4	8.65	8.95				
High Flow	4′ x 8′				31	33.3	35.8	37.6	39.3	40.5	42.4	43.5	44.8	46.5	47.8	48.8	50.2
Low Flow	4′ x 8′				17.9	19.3	20.5	21.8	22.6	23.6	24.5	25.3	26.3	27.2	27.8	28.7	
Extra Low Flow	4′ x 8′			8.3	9.2	10	10.6	11.3	11.9	12.5	13	13.4	13.9	14.3	14.6	15.2	15.5

2.13 Recommended Chilled Water Line Size

Recommended Suction Line Size			Recommended Discharge Line Size		
Line Size	Maximum Flow (gpm)	Velocity (ft/sec)	Line Size	Maximum Flow (gpm)	Velocity (ft/sec)
3″	70	3.04	1½″	60	10.5
4″	120	3.02	2″	100	10.1
6″	260	2.89	3″	220	10.1
8″	450	2.89	4″	400	10.5
10″	700	2.85	6″	850	10

TECHNICAL NOTES:

1. Maximum velocity recommended on the suction line to the circulator pump is 2–3 FPS.
2. Maximum velocity recommended on the discharge line and through the plate heat exchanger is 7–10 FPS.

2.14 Cleaning the System

It is very important that the system be cleaned before the reservoir is filled. This will retard the growth of algae which could result in fouling of the distribution pan.

Before filling the reservoir with water, you should follow the cleaning procedures as follows:

1. Remove all dirt, paper, and any other debris that accumulated during shipment and installation.

2. Fill the reservoir with 30-50 gallons of water and operate the circulating pump with the refrigeration compressor turned off. Check all liquid solution piping and components for leaks.

3. After confirming that the system has no leaks, drain the reservoir and proceed with the outlined cleaning procedure.

4. Fill the reservoir with approximately 50 gallons of 160°F water and 8 pounds of high-quality trisodium phosphate. (Mix trisodium phosphate with water before pouring into reservoir.)

5. Operate the circulating pump for 30 minutes with the refrigeration unit(s) off. During this time, brush the inside of the reservoir to clean the areas that are not submerged.

6. Drain the wash solution and fill with 30–50 gallons of lukewarm rinse water.

2.14 Cleaning the System (Continued)

7. Operate the circulating pump for 10 minutes while manually rinsing the reservoir walls that are not submerged.

8. Drain the rinse water and fill the reservoir to within 8" of the top with deionized or distilled water. Do not use softened water from a standard water softener as there is an increased possibility of chloride corrosion to the stainless steel evaporator or remote, secondary plate heat exchanger.

2.15 Test Running

After the refrigeration and water piping has been completed, the flows are set, all the electrical connections have been made, both water temperature sensors are installed, and the system has been cleaned, it is time to test run the system.

Start the circulating pump. When it is determined that the chilled-water system is operating properly, start the refrigeration system(s) and check the set points of the refrigeration units as described in Section 3.

2.16 Chlorine Gas Rusting

IMPORTANT: In rare cases it is possible for chlorine gas to escape from the water as it passes over the falling film chiller. When this occurs you will see red rust begin to form inside the chiller on the areas that are not constantly wet.

The use and regular maintenance of a charcoal filter on the incoming city water will remove most of the chlorine from the water before it enters the chiller and help to prevent this from occurring.

If filtering the water is not possible, venting the cabinet will also eliminate the chlorine gas. Venting can be accomplished by installing a fan in the top of the chiller and an air intake in the lowest point possible at the other end. This cross flow of air will remove the gas from the interior of the chiller.

If it is necessary to clean the chiller due to rusting, a #2 metal conditioner is recommended.

Contact Paul Mueller Company at 1-800-683-5537 for further technical assistance and recommendations.

SECTION 3.0 – CONDENSING UNIT SET-UP/START-UP PROCEDURES

3.1 Head Pressure Control Valve Adjustment

The head pressure control valve is required to maintain stable head pressure when the outdoor ambient temperature falls. This condensing unit has an adjustable control, which is factory set at 120 psig. The setting is increased by turning the adjusting stem clockwise, and decreased by turning it counterclockwise. Approximately 15–20 psi change in head pressure results from one complete turn of the adjusting stem. This adjustment should be made during low-ambient conditions. Refer to the table below for condensing temperatures vs. pressure.

Condensing Temperature	Head Pressure (psig)			
	R-134A	R-22	R-404A	R-507
70	71	121	149	154
80	87	144	176	180
90	104	168	210	204
100	124	196	244	237
110	146	226	281	272
120	171	260	322	312

3.2 Plate Superheat Adjustment

De-energize the hot gas solenoid valve and the liquid injection solenoid valve so they do not interfere with the plate superheat adjustment.

The evaporator plate superheat should be adjusted with a product temperature higher than what the final design product temperature requires. With a 34°F final product temperature, the superheat should initially be adjusted with a product temperature of 50°F. The superheat should be adjusted at the expansion valves located on the liquid line of the evaporator plate. Take a pressure measurement at the suction Schrader valve located on the suction header. Measure the temperature at the expansion valve suction bulb location. Set the superheat at 12°F to 13°F, which is a little high because of the 50°F product temperature. As the product temperature pulls down, the superheat should drop down to around 8°F to 10°F. If not, make final adjustments as the product temperature continues to drop.

3.3 Hot Gas Adjustment

Energize the hot gas solenoid valve keeping the liquid injection solenoid valve de-energized. As the product temperature approaches 36°F, measure the suction pressure at the compressor. When the suction pressure reaches approximately 48 psig, adjust the hot gas valve to raise the suction pressure back up to about 51 psig. (This corresponds to a 27°F evaporator temperature for R-22. Refer to temperature-pressure charts for other refrigerants.)

IMPORTANT: As you make the hot gas adjustments, observe on the compressor superheat. The superheat of the compressor will increase while you are hot-gassing since there is not any liquid injection at this time. The compressor could over heat. (Do not allow the compressor's superheat to get above 40°F. You can also monitor the compressor discharge temperature, not allowing it to exceed 200°F.) The compressor superheat adjustment will be discussed in step 3.4.

3.4 Liquid Injection Adjustment

Energize the liquid injection solenoid valve. Check the superheat at the suction line at the compressor. Open or close the liquid injection expansion valve to adjust the superheat at the compressor to 20°F to 25°F. This should result in a compressor discharge temperature below 200°F.

3.5 Ambient Fan Cycling Control Adjustment

With all fans running, the condensing temperature will range from 15 to 20 degrees above the outdoor ambient temperature. If the resulting head pressure is too low for proper system operation, it can be raised by cycling fans off and on in response to changes in the outdoor ambient temperature. Fan cycling thermostats should be adjusted according to the number of condenser fans as follows:

No. of Condenser Fans	Ambient Fan Control Setting (°F)			Minimum Outdoor Ambient
	Fan No. 1[1]	Fan No. 2 or 4[2]	Fan No. 3	
701	N/A	N/A	N/A	75
2 or 42	N/A	75	N/A	62
3	N/A	67	75	52

[1]Fan No. 1 is closest to the header end.
[2]Four fan units are duplex design and fans are cycled in pairs.

Figure 4: Condensing Unit Schematic

IMPORTANT: The condensing unit schematics are for operational reference only. Please contact Paul Mueller Company's Refrigeration Products division for unit specific schematics.

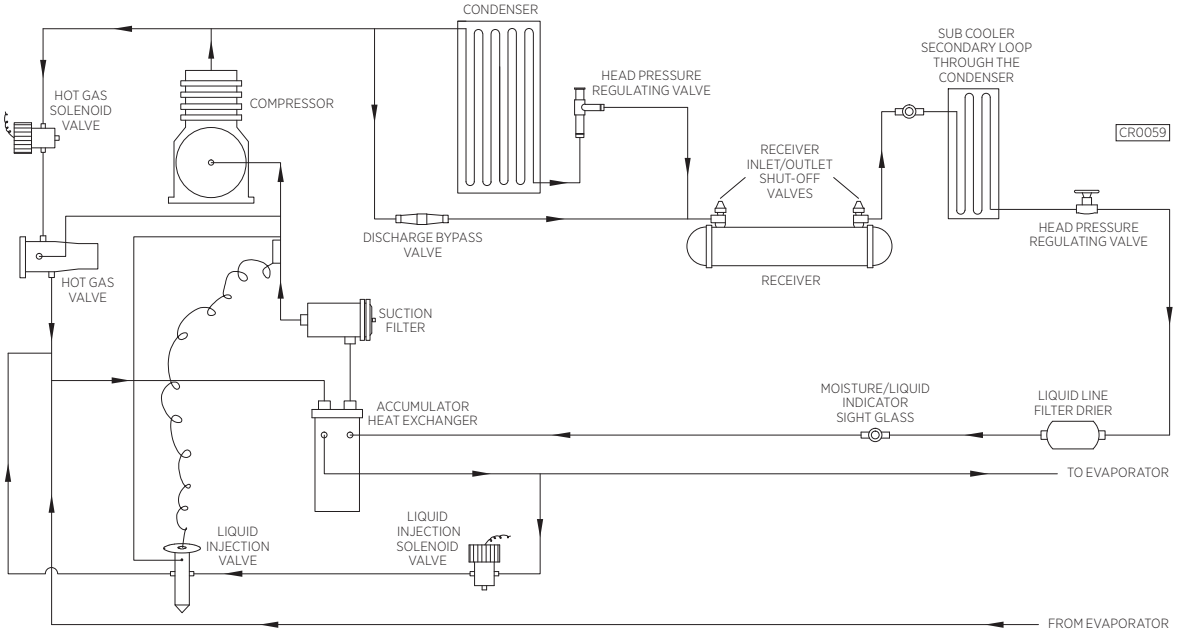
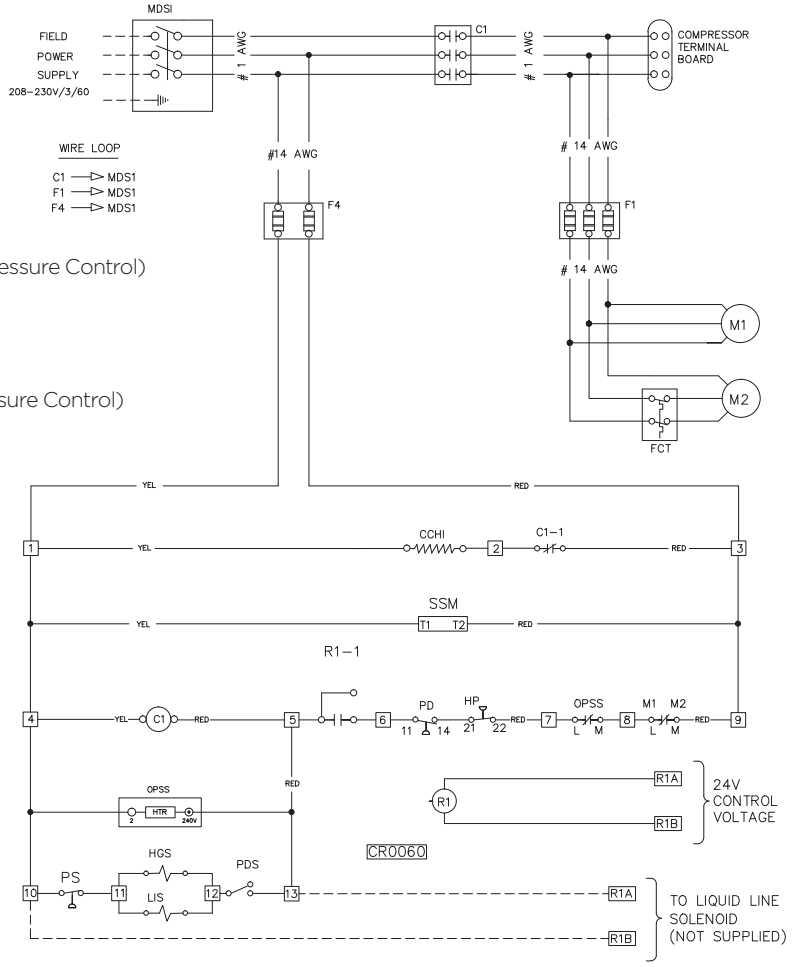


Figure 5: Wiring Schematic

LEGEND

C1	Compressor Contactor
C1-1	Auxiliary Contact on C1
CCH1	Crankcase Heater
F1	Condenser Fan Motor Fuse
F4	Control Circuit Fuse (Primary)
FCT	Fan Cycling Thermostat
HGPS	Hot Gas Pressure Switch
HGS	Hot Gas Solenoid
HP	High Pressure Contacts (Dual Pressure Control)
LIS	Liquid Injection Solenoid
M1-M2	Condenser Fan Motors
MDS1	Main Disconnect Switch
OPSS	Oil Pressure Safety Switch
PD	Pump Down Contact (Dual Pressure Control)
PDS	Pump Down Switch
PS	Pressure Switch
R1	Control Relay
TF1	Control Transformer
☐	Identifies Terminal Blocks
———	Factory Wired
- - - - - -	Field Wired



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