KeepRite® REFRIGERATION

KFM Fluid Coolers

60 Hz

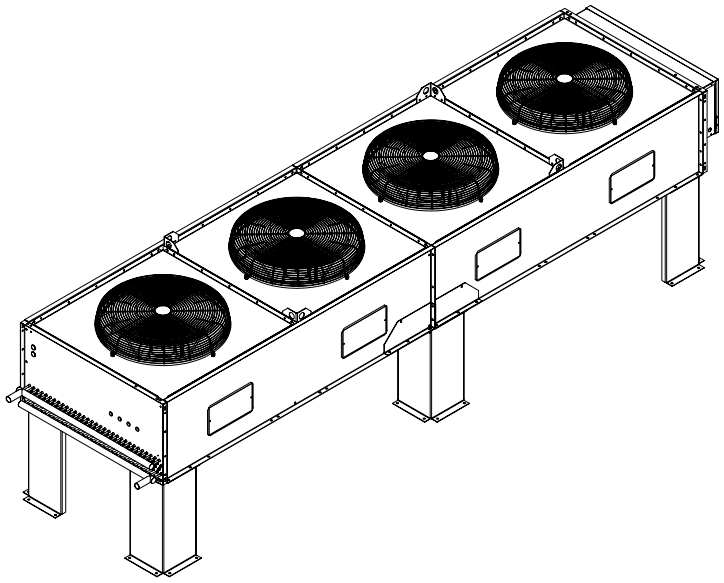
PRODUCT DATA & INSTALLATION

Bulletin K60-KFM-PDI-1
Part # 1090824

PRODUCT SUPPORT
web: **k-rp.com/kfm**
email: **acc-fc@k-rp.com**
call: **1-844-893-3222 x526**
scan:

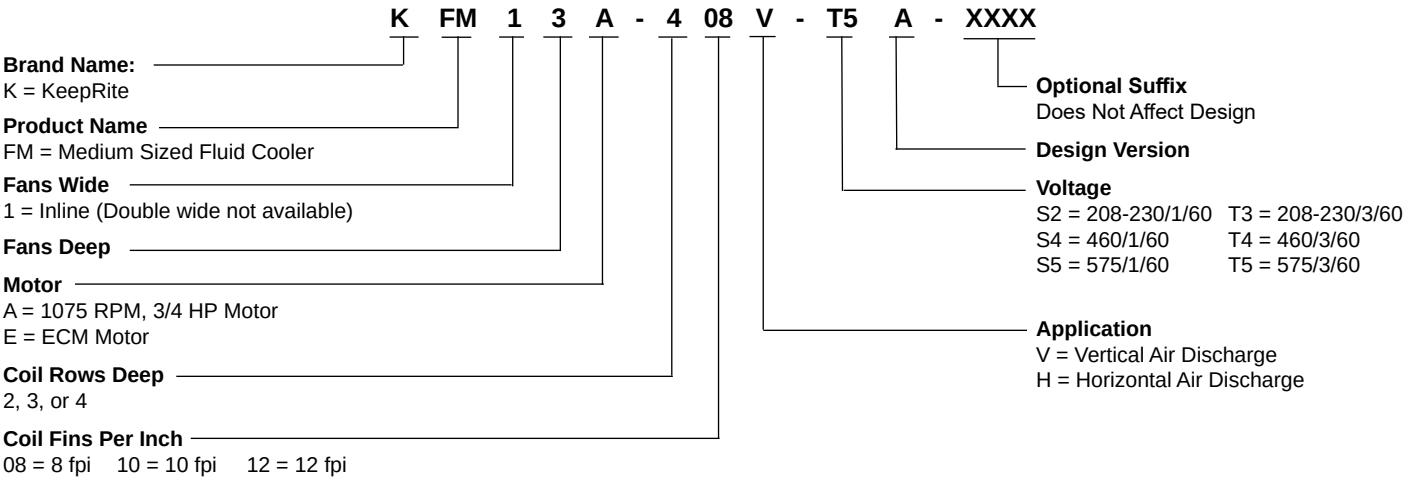
One to Four Fan Motors

Electrical Power:
208-230/1/60, 208-230/3/60,
460/1/60, 460/3/60,
575/1/60, 575/3/60



CONTENTS

NOMENCLATURE



STANDARD FEATURES INCLUDE

- **Heavy-gauge galvanized steel cabinet construction**
- **Energy efficient PSC and 3 phase fan motors** with internal overload protection
- **Quiet** "**swept wing" fan blade** for quiet operation and optimal efficiency
- **Heavy duty 24" legs**
- **All fan sections individually baffled** with clean-out panels.
- **Zinc plated huck bolts**
- **Control circuit voltage – 230 V**

OPTIONAL FEATURES

- **Fan Cycling – Ambient thermostat** / fan row with contactors
- **Fan Cycling – Aquastat thermostat fan cycling control /** outlet fluid temperature
- **Individual fan motor fusing**
- **Non-fused disconnect**
- **Horizontal air discharge configuration**
- **Variable Speed EC Motor** which provides optimum efficiency and sound levels (see pg. 9-12 for details)
- **Extended leg kits** (36" or 48") with cross bracing for extra rigidity
- **Optional fin materials**
- **Optional coil coating**
- **Voltages available for 60Hz or 50Hz**

FLUID COOLER SELECTION

Previously, the selection of a fluid cooler involved using charts, correction factors and hand calculations to determine the capacity and make the selection.

We have simplified the selection process. Our engineering department has created a computer program. This provides flexibility and streamlines the selection process

TEMPERATURE LIMITATIONS

Fluid Coolers are suitable for leaving air temperatures up to a maximum of 130°F *(54°C)*. Fluid temperature up to an average of 150°F *(66°C)* may be used at ambient temperatures up to 90°F *(32°C).* Entering fluid conditions should not exceed 200°F *(93°C)*.

PARAMETERS FOR SELECTION OF A FLUID COOLER

Fluid Type: □ **Water** □ **Ethylene Glycol / Water** □ **Propylene Glycol / Water**

Elevation: _____ **Feet Above Sea Level**

Fluid Concentration: _____**%Water** _____**%Glycol**

Air Inlet (ambient temp.) _____ **ºF**

Three of the four following parameters must be specified:

1. Required Capacity _____ **Btu/h** **2. Fluid Inlet Temperature** _____ **ºF**

3. Fluid Flow Rate _____ **GPM** **4. Fluid Outlet Temperature** _____ **ºF**

Other Items To Specify:

1. Voltage (S2 = 208-230/1/60 S4 = 460/1/60 S5 = 575/1/60
T3 = 208-230/3/60 T4 = 460/3/60 T5 = 575/3/60) _____Specify S2,S4, S5,T3,T4 or T5

2. Please Specify (Check Box) Options Required:

- ☐ Control Voltage 240V (Standard)
- ☐ Control Voltage 120V
- ☐ Control Voltage 24V
- ☐ Fan Cycling Ambient Thermostat
- ☐ Fan Cycling Aquastat Thermostat
- ☐ Fan Cycling Control by Others
- ☐ Non-fused disconnect
- ☐ Horizontal air discharge configuration
- ☐ Variable Speed EC Motor
- ☐ Extended leg kits 36”
- ☐ Extended leg kits 48”
- ☐ Gold Coat Fin
- ☐ Copper Fin
- ☐ Heresite Coating
- ☐ 50 Hz

Customer Info:

Name: _____ **Telephone Number:** _____

Fax: _____ **Email:** _____

Fax or email completed sheet to your sales representative.

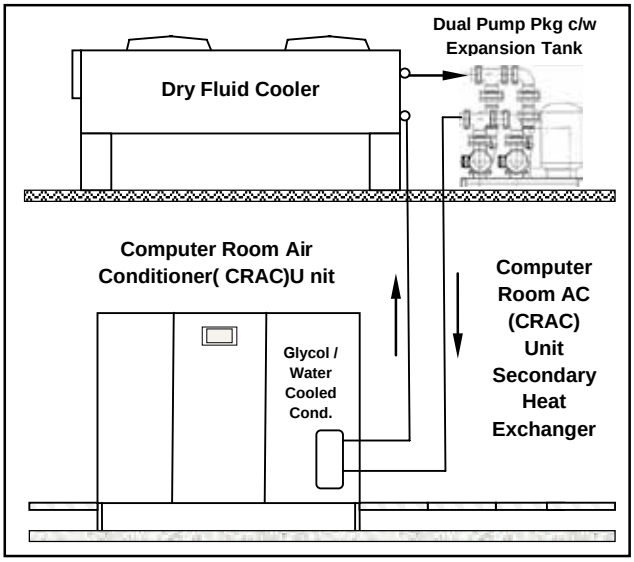
Extra copies of this form available on page 21

Data Center / Computer Rooms

Fluid Coolers are suitable for use with Computer Room Air Conditioning (CRAC) Units. (see Illustration below)

Dry Type Fluid Coolers are particularly suitable for applications where long pipe runs of refrigerant piping to an air cooled condenser are not practical. Cooling Tower maintenance and winter operation issues are eliminated. Piping can be easily installed and low ambient control can be used using water regulating valves. Fluid cooler can be easily connected to city water for emergency use.

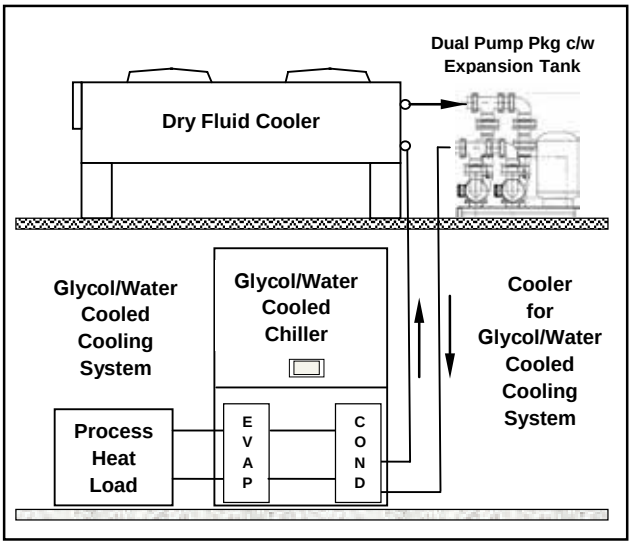
The glycol loop is sometimes connected to a “Free-Cooling” Economizer Coil within the CRAC unit, which allows for partial free-cooling when the glycol loop temperature is below the CRAC units return air temperature.



Industrial Glycol /Water Cooling Systems

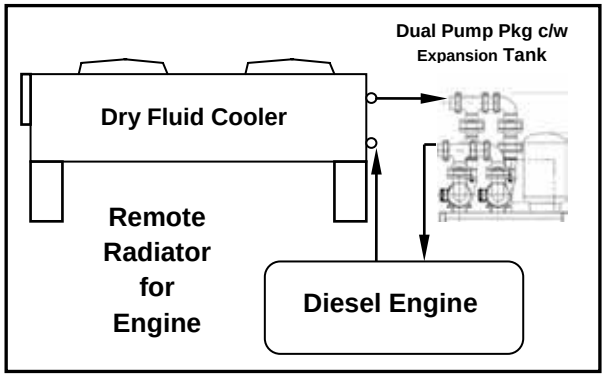
Water pollution issues and water conservation have become critical in recent years. The “Once-Only” use of water for industrial process cooling has been wasteful and often unnecessary. By using a dry type Fluid Cooler, glycol/water for industrial process cooling applications can be cooled to within 10°F (*6°C*) of the ambient dry bulb temperature. The water is continuously re-circulated and remains in a closed system so reducing the problem of corrosion normally encountered in non re-circulated systems.

Considerable savings can be affected by using a Dry Type Fluid Cooler. Many industrial applications have seen water consumption being reduced by millions of gallons and reduced maintenance costs to a fraction of that experienced prior to the use of a closed non re-circulated system. (see illustration below)



Remote Radiators for Diesel and Gas Engines

A remote radiator is usually required with the larger style of diesel engine. The Fluid Cooler is suitable for this type of application. Designed to give the customer trouble free operation, the multiple fan arrangement reduces the possibility of down time. Units are completely pre-assembled and require only piping and electrical connections. (see illustration to the right)



PHYSICAL / MECHANICAL DATA

MODEL NO.	FPI	FAN CONFIG.	1075 RPM (A)			ECM (E)			INTERNAL VOLUME (3)		APPROX. DRY SHIPPING WEIGHT	
			AIR FLOW RATE (1)		SOUND LEVEL (2)	AIR FLOW RATE (1)		SOUND LEVEL (2)				
			CFM	*(m^3/h)*	dBA	CFM	*(m^3/h)*	dBA	US	*(LITRES)*	LBS.	*(kg.)*
KFM 11*-310	**10**	1 x 1	**6870**	*11670*	**51**	**6180**	*10500*	50	**1.9**	*7.2*	**245**	*111*
KFM 11*-312	**12**	1 x 1	**6640**	*11280*	*51*	**5980**	*10160*	50	**1.9**	*7.2*	**250**	*114*
KFM 11*-410	**10**	1 x 1	**6620**	*11250*	*51*	**5960**	*10130*	50	**2.5**	*9.5*	**265**	*120*
KFM 11*-412	**12**	1 x 1	**6400**	*10870*	*51*	**5760**	*9790*	50	**2.5**	*9.5*	**270**	*123*
KFM 12*-208	**8**	1 x 2	**14800**	*25150*	*53*	**13320**	*22630*	52	**2.4**	*9.1*	**410**	*186*
KFM 12*-210	**10**	1 x 2	**14400**	*24470*	*53*	**12960**	*22020*	52	**2.4**	*9.1*	**415**	*189*
KFM 12*-212	**12**	1 x 2	**13900**	*23620*	*53*	**12510**	*21250*	52	**2.4**	*9.1*	**420**	*191*
KFM 12*-308	**8**	1 x 2	**14200**	*24130*	*53*	**12780**	*21710*	52	**3.6**	*13.6*	**450**	*205*
KFM 12*-310	**10**	1 x 2	**13700**	*23280*	*53*	**12330**	*20950*	52	**3.6**	*13.6*	**455**	*207*
KFM 12*-312	**12**	1 x 2	**13300**	*22600*	*53*	**11970**	*20340*	52	**3.6**	*13.6*	**460**	*209*
KFM 12*-408	**8**	1 x 2	**13700**	*23280*	*53*	**12330**	*20950*	52	**4.8**	*18.2*	**480**	218
KFM 12*-410	**10**	1 x 2	**13200**	*22430*	*53*	**11880**	*20180*	52	**4.8**	*18.2*	**490**	*223*
KFM 12*-412	**12**	1 x 2	**12800**	*21750*	*53*	**11520**	*19570*	52	**4.8**	*18.2*	**500**	*227*
KFM 13*-308	**8**	1 x 3	**21300**	*36190*	*54*	**19170**	*32570*	53	**5.4**	*20.4*	**630**	*286*
KFM 13*-310	**10**	1 x 3	**20600**	*35000*	*54*	**18540**	*31500*	53	**5.4**	*20.4*	**640**	*291*
KFM 13*-312	**12**	1 x 3	**19900**	*33810*	*54*	**17910**	*30430*	53	**5.4**	*20.4*	**650**	*295*
KFM 13*-408	**8**	1 x 3	**20500**	*34830*	*54*	**18450**	*31350*	53	**7.2**	*27.3*	**680**	*309*
KFM 13*-410	**10**	1 x 3	**19900**	*33810*	*54*	**17910**	*30430*	53	**7.2**	*27.3*	**695**	*316*
KFM 13*-412	**12**	1 x 3	**19200**	*32620*	*54*	**17280**	*29360*	53	**7.2**	*27.3*	**710**	*323*
KFM 14*-308	**8**	1 x 4	**28400**	*48250*	*55*	**25560**	*43430*	54	**7.1**	*26.9*	**810**	*368*
KFM 14*-310	**10**	1 x 4	**27500**	*46720*	*55*	**24750**	*42050*	54	**7.1**	*26.9*	**825**	*375*
KFM 14*-312	**12**	1 x 4	**26600**	*45190*	*55*	**23940**	*40670*	54	**7.1**	*26.9*	**840**	*382*
KFM 14*-408	**8**	1 x 4	**27400**	*46550*	*55*	**24660**	*41900*	54	**9.5**	*36.0*	**880**	*400*
KFM 14*-410	**10**	1 x 4	**26500**	*45020*	*55*	**23850**	*40520*	54	**9.5**	*36.0*	**900**	*409*
KFM 14*-412	**12**	1 x 4	**25600**	*43490*	*55*	**23040**	*39140*	54	**9.5**	*36.0*	**920**	*418*

NOTES:
* Insert voltage code (see Nomenclature, page 2)
(1) For 50 HZ fan data, use 60 Hz CFM (*m^3/h*) x 0.83
(2) Sound level pressure at 30 ft (*10m*)
(3) Not including headers.

ELECTRICAL DATA

1075 RPM MODELS - SINGLE PHASE

NO. OF FAN MOTORS	208-230/1/60				460/1/60				575/1/60			
	TOTAL FLA	MCA	MOP	WATTS	TOTAL FLA	MCA	MOP	WATTS	TOTAL FLA	MCA	MOP	WATTS
1	3.6	4.5	15.0	790	1.7	2.1	15	810	1.4	1.8	15.0	830
2	7.2	8.1	15.0	1580	3.4	3.8	15	1620	2.8	3.2	15.0	1660
3	10.8	15.1	20.0	2370	5.1	5.5	15	2430	4.2	4.6	15.0	2490
4	14.4	15.3	20.0	3160	6.8	7.2	15	3240	5.6	6.0	15.0	3320

1075 RPM MODELS - THREE PHASE

NO. OF FAN MOTORS	208-230/3/60				460/3/60				575/3/60			
	TOTAL FLA	MCA	MOP	WATTS	TOTAL FLA	MCA	MOP	WATTS	TOTAL FLA	MCA	MOP	WATTS
1	2.3	2.9	15.0	720	1.2	1.4	15	720	0.9	1.1	15.0	720
2	4.6	5.2	15.0	1440	2.3	2.6	15	1440	1.8	2.0	15.0	1440
3	6.9	7.5	15.0	2160	3.5	3.7	15	2160	2.7	2.9	15.0	2160
4	9.2	9.8	15.0	2880	4.6	4.9	15	2880	3.6	3.8	15.0	2880

Fan Cycling Control

When a remote air cooled Fluid Cooler is installed outdoors, it will be subjected to varying temperatures. Within many areas, winter to summer annual temperature swings can be as high as 120°F *(48.9°C)* or so. This will have a major impact on the performance of the Fluid Cooler. As the ambient temperature drops, the Fluid Cooler capacity increases due to a wider temperature difference between ambient air and entering fluid temperature. As this happens, the leaving fluid temperature drops as well. Cycling of the Fluid Cooler fans helps control the leaving fluid temperature. With this approach to solving low ambient problems, fans are taken off-line one at a time. It is not recommended that multiple fan Fluid Coolers cycle more than two (2) fans per step. The reason for this is that the fluid temperature will change drastically as several fans are taken off-line at the same time. This could result in excessive tube stress within the unit, due to rapid expansion and contraction of the coil which could lead to needless tube failure.

Fans closest to the inlet header should be set to run whenever the fluid circulating pump is running.

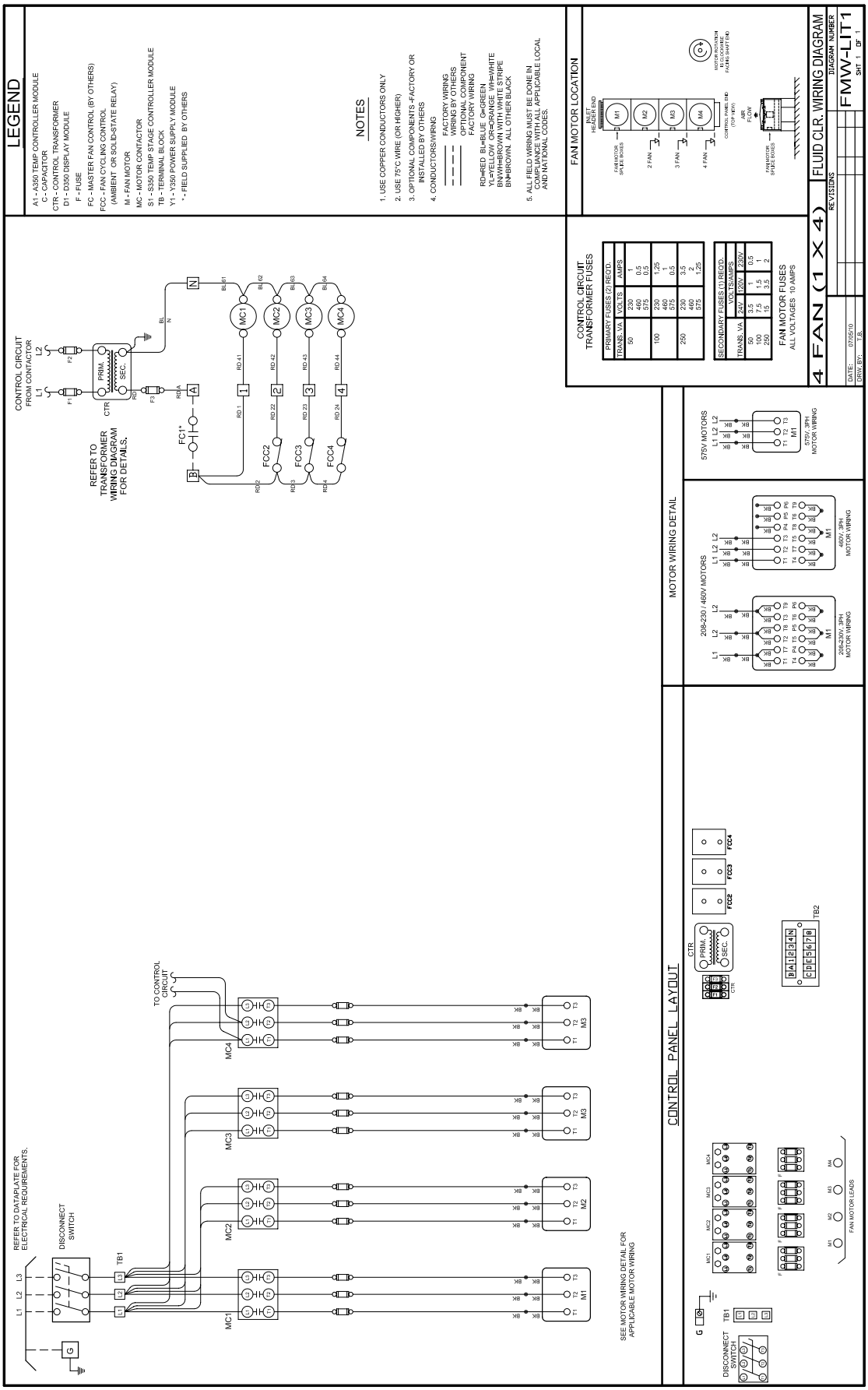
Substantial fan motor power savings can be realized as well using this method.

For low ambient conditions, optional ***Aquastats (Fluid Temperature Controllers)*** are used to cycle fans on and off as required to maintain constant leaving glycol/water temperature as per the schedules below.

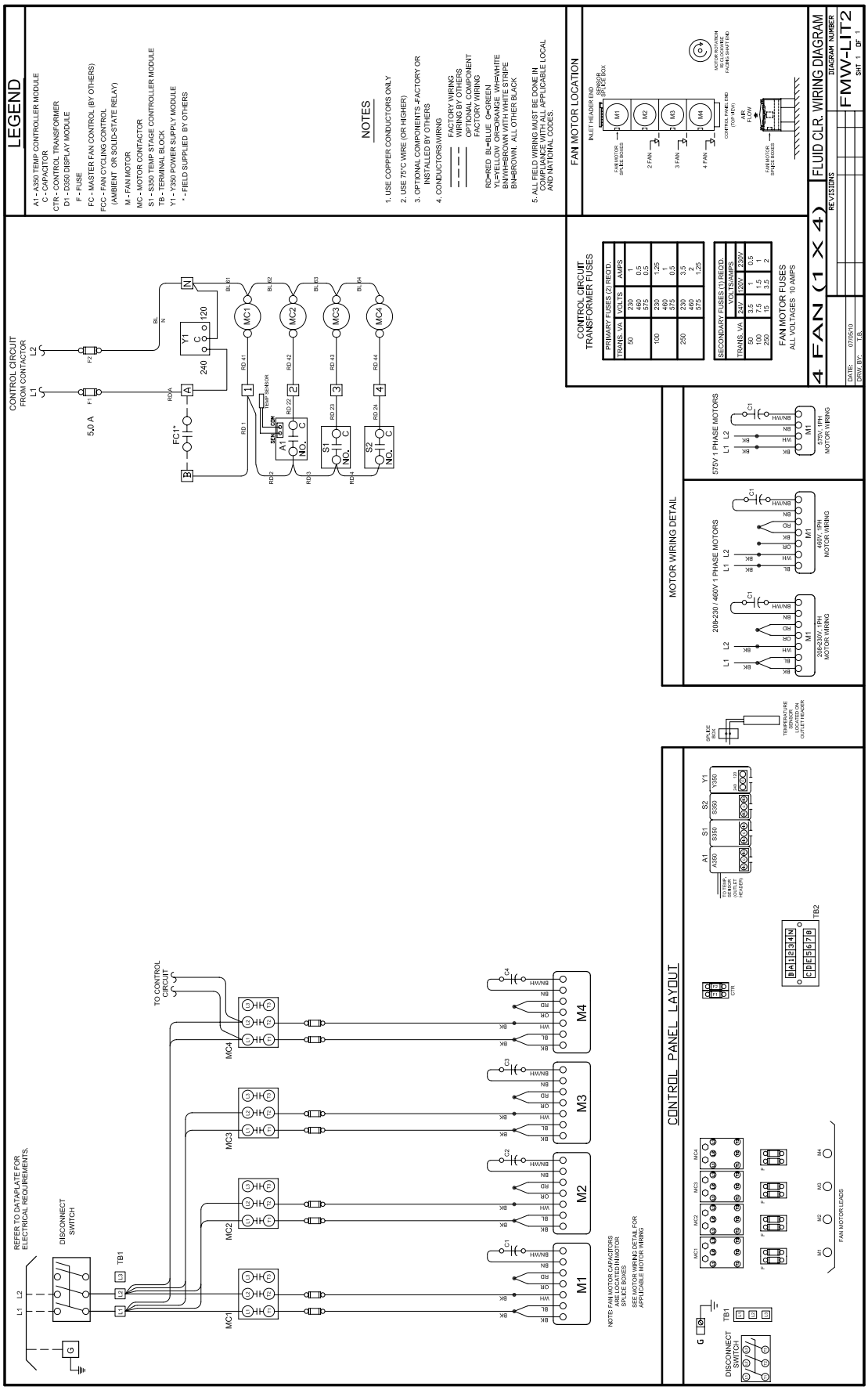
Fan Cycling Control Schedule

FAN ARRANGEMENT SINGLE ROW	FANS CYCLED	FANS IN CONSTANT OPERATION	FANS AVAILABLE FOR VARIABLE SPEED CONTROL
1 FAN HEADER END FAN 1 CONTROL PANEL END		●	●
2 FAN FAN 1 FAN 2	1 STAGE	●	●
3 FAN FAN 1 FAN 2 FAN 3	2'ND STAGE 1'ST STAGE	●	●
4 FAN FAN 1 FAN 2 FAN 3 FAN 4	3'RD STAGE 2'ND STAGE 1'ST STAGE	●	●

WIRING DIAGRAM
AMBIENT FAN CYCLING



WIRING DIAGRAM
AQUASTAT FAN CYCLING



Fluid coolers utilizing electrically commutated motor (EC motor) technology offer many benefits; Improved Efficiency, Reduced Sound Levels, Speed Control, Simplicity and Reliability

Efficiency
The speed control function of an EC motor allows the condenser to run at optimized energy levels at different operating conditions. Up to 75% in energy savings can be realized when comparing the EC motor speed control method to a conventional fan cycling method.

Sound
As EC motor speeds vary for different operating conditions they also offer reduced sound levels when compared to conventional motor running full speed. Sound levels are reduced on cooler days and in evenings.

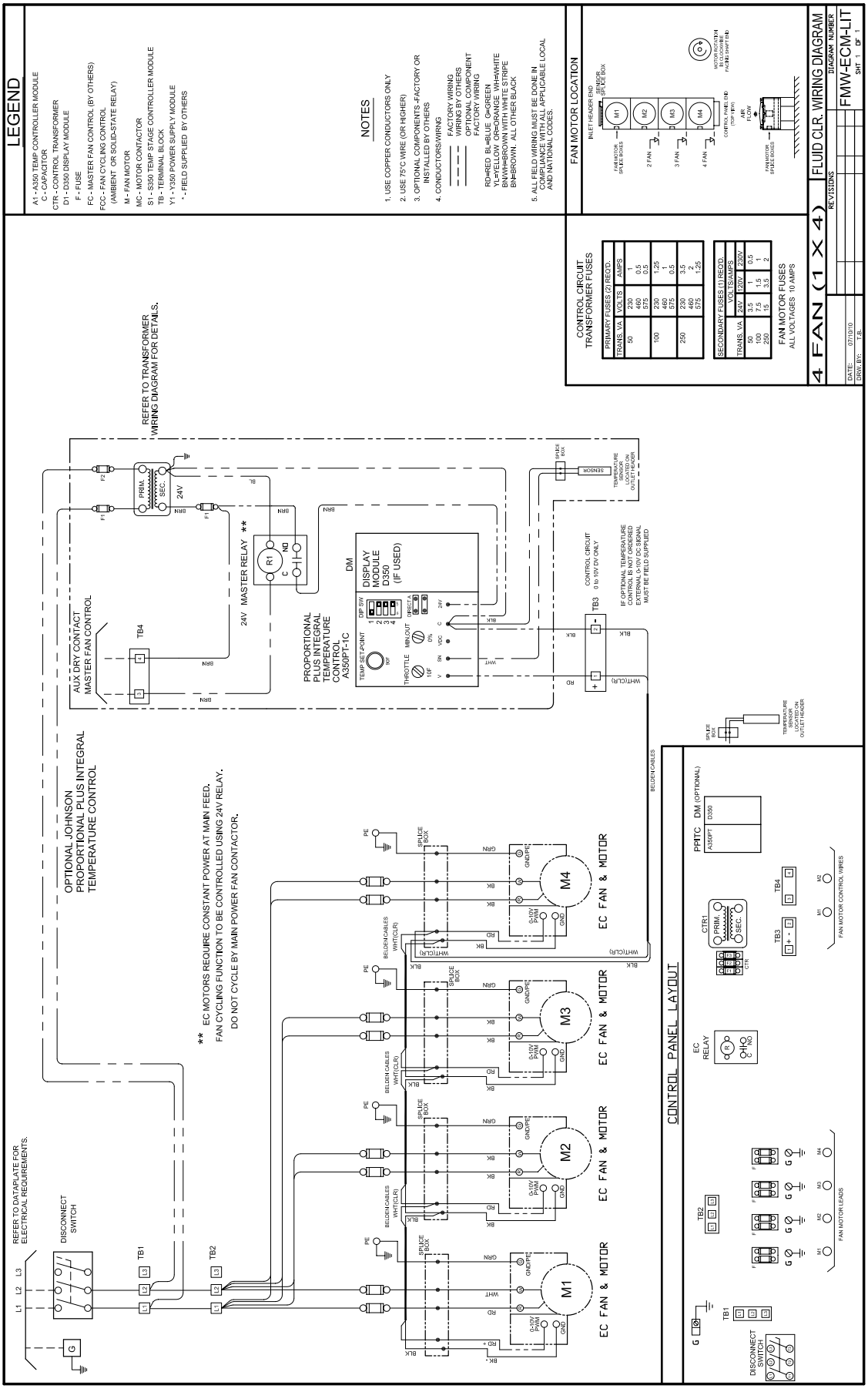
Simplicity and Reliability
The installation and control of EC motors is very simple compared to other methods of speed control used on conventional AC motors. Lower running operating temperatures and smooth transitional speed changes make EC motors durable and reliable.

ELECTRICAL DATA

ECM 1075 RPM MODELS - SINGLE PHASE

NO. OF FAN MOTORS	208-230/1/60			
	TOTAL FLA	MCA	MOP	WATTS
1	6.3	7.9	15	560
2	12.6	14.2	15	1120
3	18.9	20.5	25	1680
4	25.2	26.8	30	2240

WIRING DIAGRAM
MODELS WITH EC MOTORS



Motors With Built-in Variable Speed –

Optional “E” Fan/motor Code

Units with an E (in nomenclature) motor designation use an EC (electronically commutated) motor / fan combination to provide variable speed fan motor control. ECM fan/motor combinations use DC motors with integral AC to DC conversion allowing direct connection to AC mains with the energy saving and control benefits of a DC motor. Ideally the motors on the fluid cooler should all be EC and simultaneously slow down /speed up together. This provides for maximum energy savings. However some applications may exist where just the last fan or pair of fans (ones closest to header) is solely EC motors. (The remaining conventional type motors are then cycled off by fan cycling temperature controls).

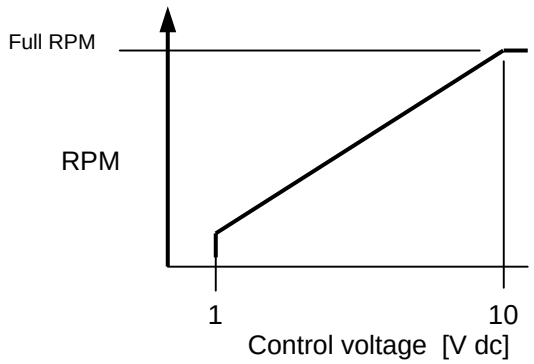
Important Warnings:

(Please read before handling motors)

1. When connecting the unit to the power supply, dangerous voltages occur. Due to motor capacitor discharge time, do not open the motor within 5 minutes after disconnection of all phases.
2. With a Control voltage fed in or a set speed value being saved, the motor will restart automatically after a power failure.
3. Dangerous external voltages can be present at the motor terminals even when the unit is turned off.
4. The Electronics housing can get hot.
5. The cycling on and off of EC motors should be controlled by the DC control voltage (i.e. 0V DC will turn motor off). Excessive cycling of the motor by line voltage contactors may cause stress on the motors and reduce the motor life.

Speed adjustment Characteristics

The EC motor varies its speed linearly based on a 1-10V input signal. At 10 VDC, the motor runs at full speed. At 0 to approx. 1 VDC, the motor turns off. A chart of the speed control curve is shown below. The motor can be controlled at any speed below its nominal RPM.



Control Signal

The input control signal can be supplied by an external control signal or from a factory installed proportional temperature control. Units with factory installed proportional temperature controls require no installation wiring and are adjusted with initial factory settings. These may require further adjustments to suit local field conditions.

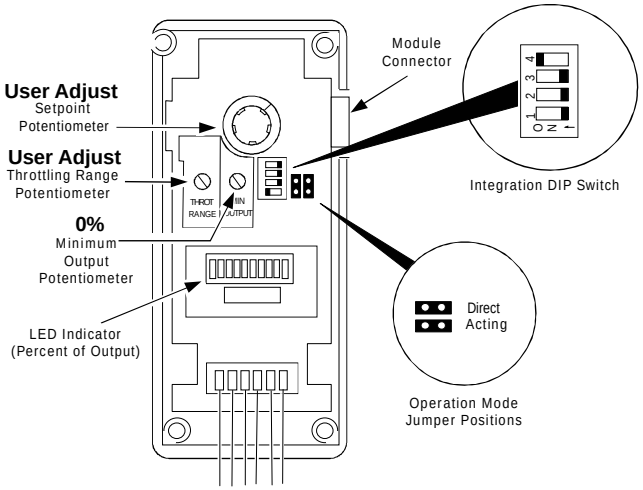
External Control Signal (Supplied by others)

Contact control manufacturer for setup of external controller to provide a 0-10 VDC control signal. Wire the control signal to terminal board in unit control box. Refer to the fluid cooler EC wiring diagram for typical external signal control wiring.

A350P Proportional Temperature Control (Factory Installed)
Units equipped with factory installed A350 controls use a proportional plus integral temperature controller to vary and maintain the motor speed at the desired fluid outlet temperatures. The controller has two main user adjustable features:

- Temperature Set point
- Throttling range

Leave the minimum Output setting at 0% and Jumpers should be set for Direct Acting (do not re-adjust)



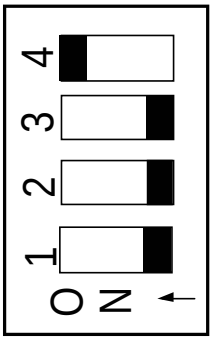
Fluid Temperature Set point
The fluid temperature set point potentiometer is adjustable from -30°F to 130°F.
Note: Very low set points may cause the fan motors to run full speed continually even if the fluid cooler is properly sized. The fans will turn off if the fluid temperature falls below the desired set point.

Minimum Output
The minimum output potentiometer controls the minimum signal sent to the motor and is factory set at 0%. It is adjustable between 0 and 60% of the output range. If this is adjusted to 50%, the motors will not start running until 5V is applied to the motor. The motor will start running at 50% of full speed. To maximize sound reduction and energy savings and to provide the most stable control, it is recommended this setting be left at 0%.

Throttling range
The throttling range potentiometer controls how far the system fluid temperature deviates from the control set point to generate a 100% output signal from the control and is adjustable from 2°F to 30°F range. The throttling range determines how quickly the motor will reach full speed when detecting a change in fluid temperature. For example, if the set point is 90°F and the throttling range is 10°F when the system temperature drops below 90°F, the fans will be off. When the system temperature reaches 100°F (90 + 10) the fans will be at maximum full speed. To make the fans ramp more slowly the throttling range should be increased. To maximize sound reduction and energy efficiency and to provide for the most stable control, it is recommended this setting be left at 10°F.

Reverse acting or direct acting mode of operation
The reverse acting/direct acting jumper is used to ensure the controller responds correctly to the desired fluid temperature. In Direct Acting (DA) mode, the motor speed increases as the temperature rises above desired set point. For proper fluid cooler operation, this jumper MUST be in Direct Acting (DA) mode. Failure to ensure J1 jumper is in direct acting mode will cause the system to trip on high fluid temperatures.

Integration constant
The integration constant switch provides ability to change controller from a proportional only control to a proportional plus integral control. To provide the most responsive system and to maintain a stable fluid temperature, it is recommended the integration setting be left on "fast" with the Mode switch set to OFF (Proportional AND Integral activated)



FAST (on)

MEDIUM (off)

SLOW (off)

OFF (set for PROPORTIONAL / INTEGRAL MODE)

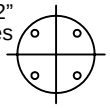
HEADER SIZES

GPM *(fps)*	**HEADER SIZE O.D. inches** *(mm)*	**CONNECTIONS AVAILABLE**
0 - 10 *(0.0 - 3.9)*	1 1/8 *(29)*	PLAIN or MPT
11 - 20 *(2.8 - 5.1)*	1 3/8 *(35)*	PLAIN or MPT
21 - 30 *(3.8 - 5.4)*	1 5/8 *(41)*	PLAIN or MPT
31 - 50 *(3.2 - 5.2)*	2 1/8 *(54)*	PLAIN, MPT or FLANGED
51 - 80 *(3.4 - 5.4)*	2 5/8 *(67)*	PLAIN or MPT
81 - 150 *(3.8 - 7.1)*	3 1/8 *(79)*	PLAIN, MPT or FLANGED

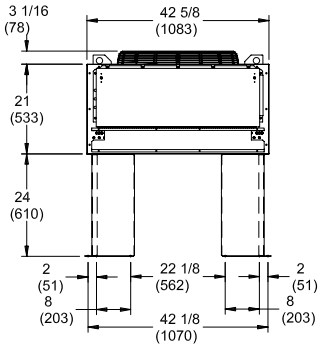
OPTIONAL FACTORY SUPPLIED FLANGES				
SIZE In. *(mm)*	**FITTING**	**FLANGE DIA. In.** *(mm)*	**BOLT CIRCLE In.** *(mm)*	**HOLES - QTY @ In.** *(mm)*
2 *(50.8)*	Flanged	6 *(152.4)*	4 3/4 *(120.7)*	**4** @ 3/4 *(19)*
3 *(76.2)*	Flanged	7 1/2 *(190.5)*	6 *(152.4)*	**4** @ 3/4 *(19)*

OPTIONAL FLANGED CONNECTIONS
BOLT HOLE LOCATION
(150 lbs. working shock pressure)

6” & 7 1/2” Dia. Flanges

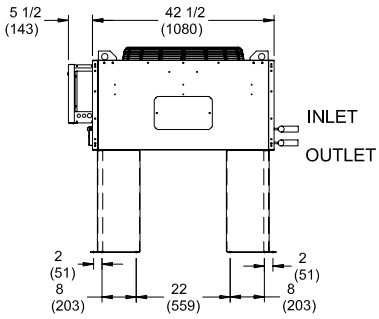


ELECTRICAL END VIEW

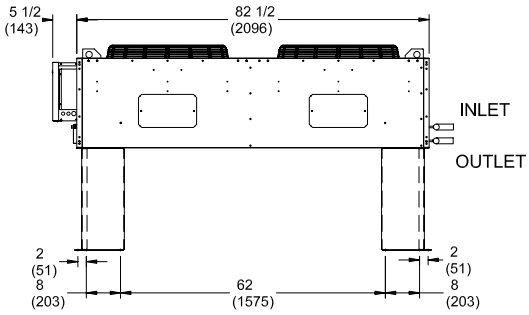


SIDE VIEW

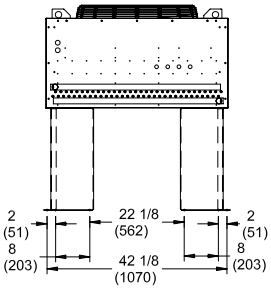
1 FAN LONG



2 FAN LONG



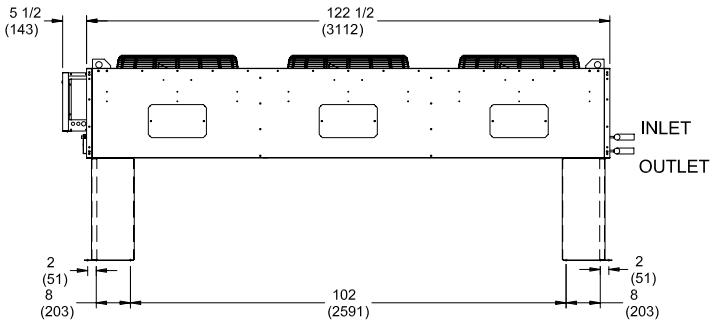
PIPING END VIEW



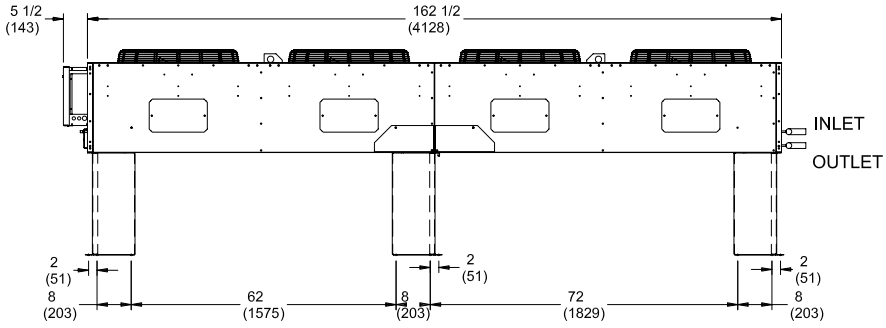
DIMENSIONS ARE IN INCHES (mm)

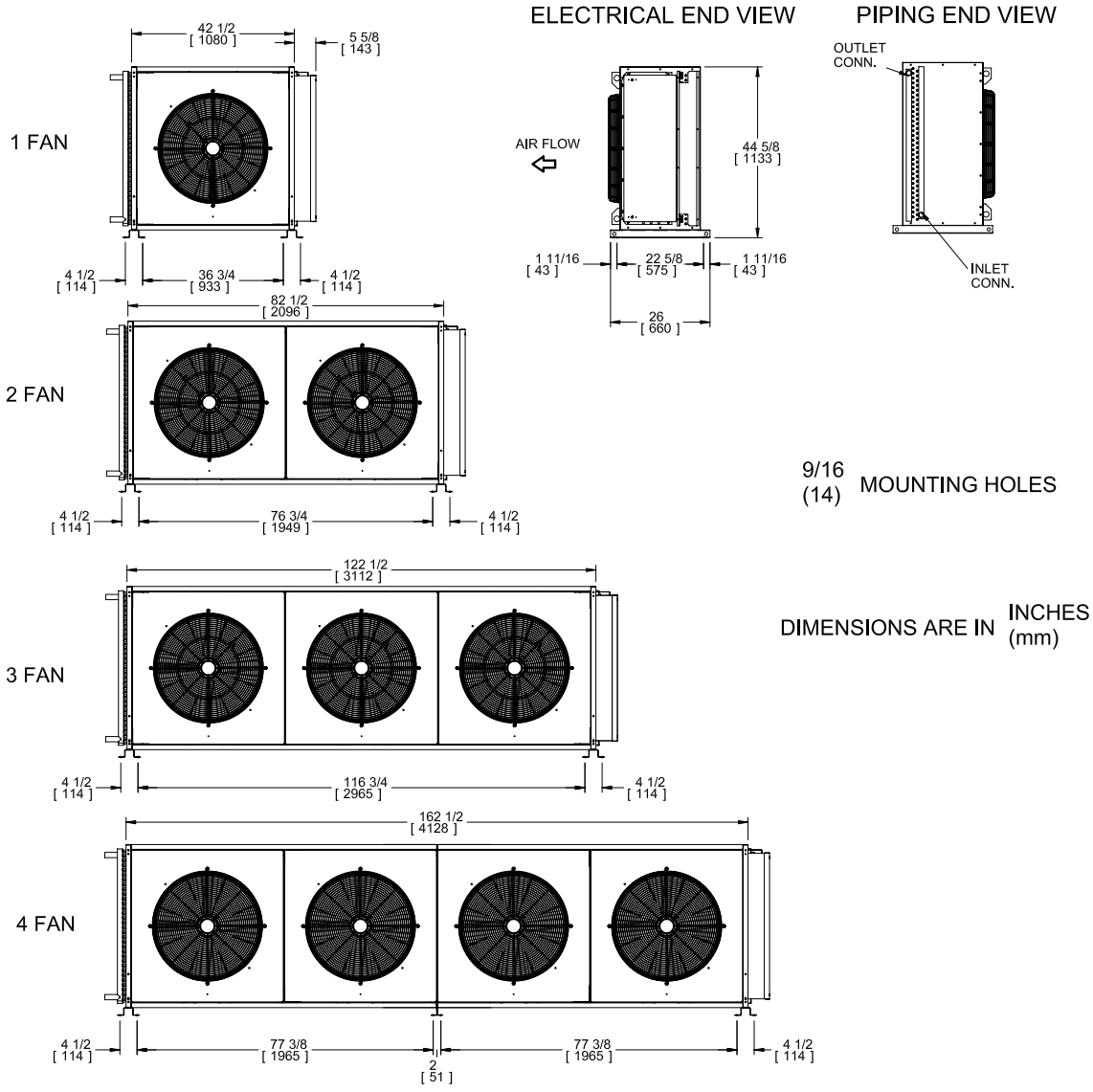
7/16 (11) MOUNTING HOLES

3 FAN LONG

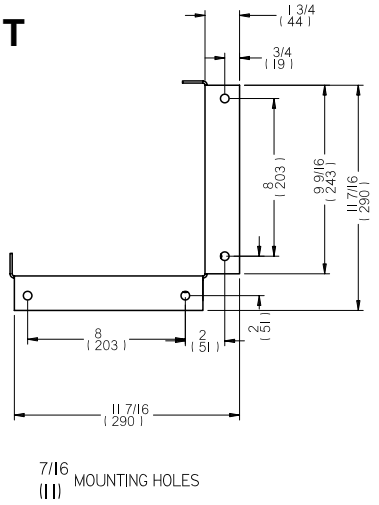


4 FAN LONG





LEG FOOTPRINT



⚠ WARNING ⚠

ADEQUATE PRECAUTIONS MUST BE TAKEN, AFTER FIELD LEAK TESTING TO INSURE REMOVAL OF WATER IN TUBES. IT IS RECOMMENDED THAT AN INHIBITED GLYCOL SOLUTION BE USED TO FLUSH THE COMPLETE COIL. FAILURE TO TAKE PRECAUTIONS CAN RESULT IN FROZEN TUBES SHOULD THE UNIT BE SUBJECTED TO LOW AMBIENT CONDITIONS BEFORE PLACED IN OPERATION.

INSPECTION

A thorough inspection of the equipment, including all component parts and accessories, should be made immediately upon delivery. Any damage caused in transit, or missing parts, should be reported to the carrier at once. The consignee is responsible for making any claim for losses or damage. Electrical characteristics should also be checked at this time to ensure that they are correct.

LOCATION

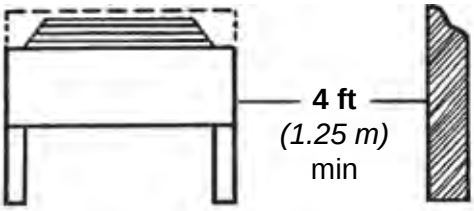
Before handling and placing the unit into position a review of the most suitable location must be made. This fluid cooler is designed for outdoor installation. A number of factors must be taken into consideration when selecting a location. Most important is the provision for a supply of ambient air to the fluid cooler, and removal of heated air from the fluid cooler area. Higher fluid temperatures, decreased performance, and the possibility of equipment failure may result from inadequate air supply.

Other considerations include:

1. Customer requests
2. Loading capacity of the roof or floor.
3. Distance to suitable electrical supply.
4. Accessibility for maintenance.
5. Local building codes.
6. Adjacent buildings relative to noise levels.

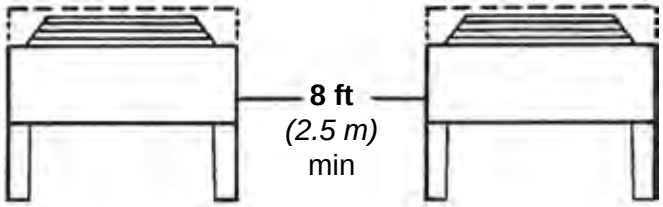
WALLS OR OBSTRUCTIONS

All sides of the unit must be a minimum of **4 feet** *(1.25 m)* away from any wall or obstruction. Overhead obstructions are not permitted. If enclosed by three walls, the fluid cooler must be installed as indicated for units in a pit.



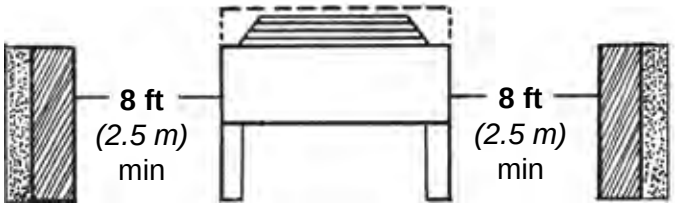
MULTIPLE UNITS

A minimum of **8 feet** *(2.5 m)* is required between multiple units placed side by side. If placed end to end, the minimum distance between units is **4 feet** *(1.25 m)*.



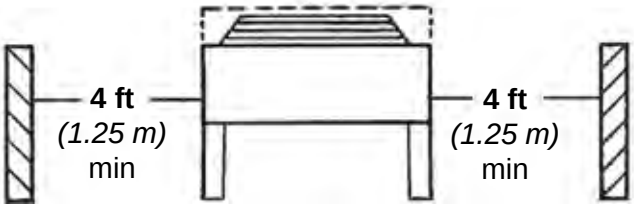
UNITS IN PITS

The top of the fluid cooler must be level with, or above the top of the pit. In addition, a minimum of **8 feet** *(2.5 m)* is required between the unit and the pit walls.



LOUVERS/FENCES

Louvers/fences must have a minimum of 80% free area and **4 feet** *(1.25 m)* minimum clearance between the unit and louvers/fence. Height of louver/fence must not exceed top of unit.



LIFTING INSTRUCTIONS

Air cooled fluid coolers are large, heavy mechanical equipment and must be handled as such. A fully qualified and properly equipped crew with necessary rigging should be engaged to set the fluid cooler into position. Lifting holes have been provided at the corners or along sides for attaching lifting slings. Spreader bars must be used when lifting so that lifting forces are applied vertically. See Fig. 2. **Under no circumstances should the coil headers or return bends be used in lifting or moving the fluid cooler.**

FIG. 1

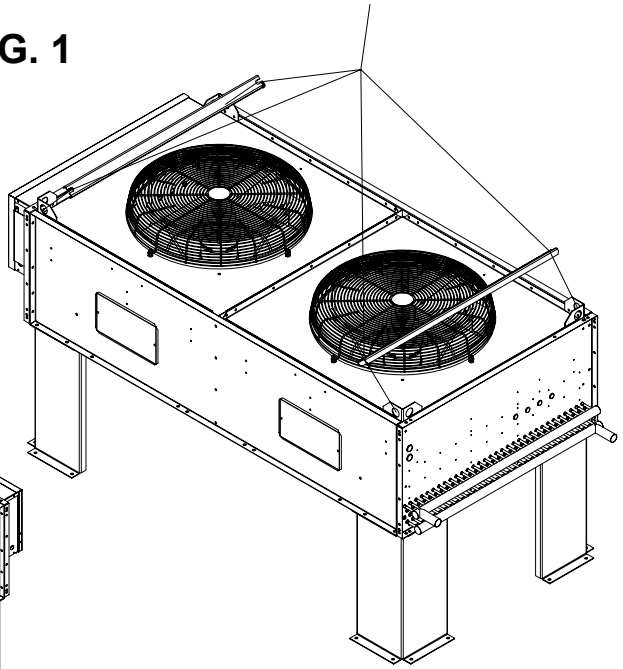
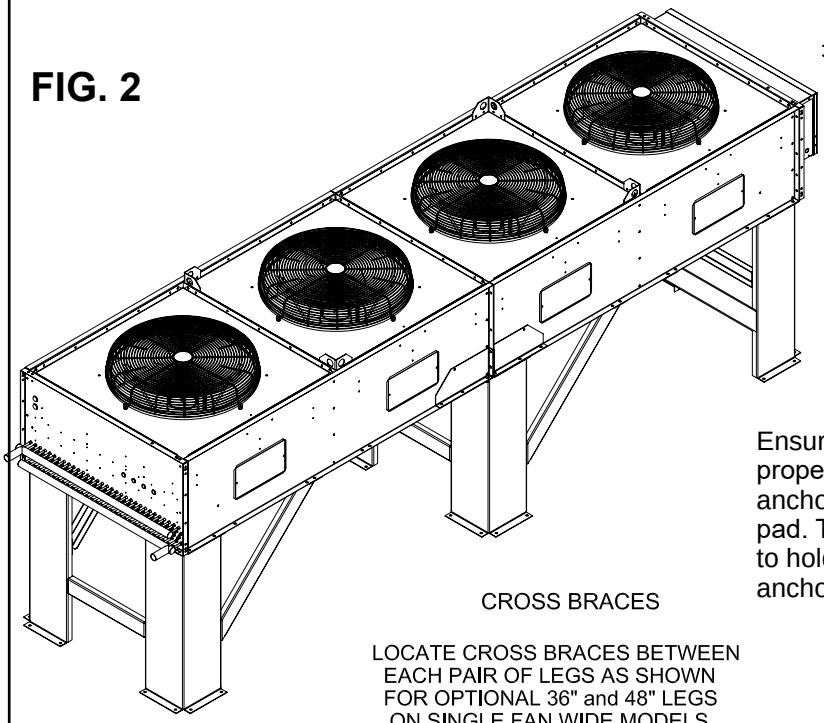


FIG. 2



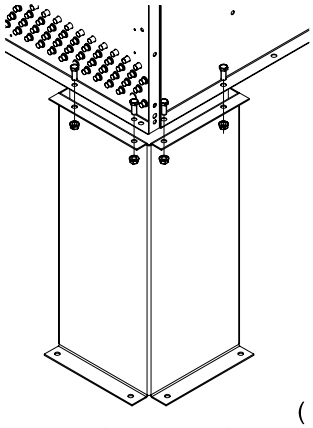
CROSS BRACES

LOCATE CROSS BRACES BETWEEN EACH PAIR OF LEGS AS SHOWN FOR OPTIONAL 36" and 48" LEGS ON SINGLE FAN WIDE MODELS

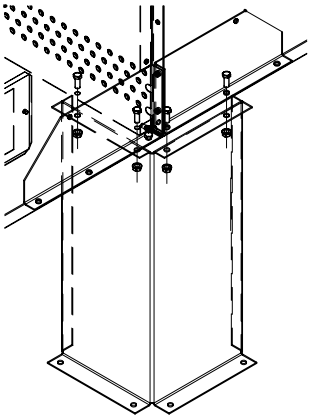
Ensure the unit is placed in a level position (to ensure proper drainage of fluid). The legs should be securely anchored to the building structure, sleeper or concrete pad. The weight of the fluid cooler alone is not enough to hold in place during a strong wind, the legs must be anchored.

LEG INSTALLATION INSTRUCTIONS

FIG 3.



CORNER LEG



CENTRE LEG
(R.H. SIDE FACING HEADER END)
USED ON 4 FAN MODELS ONLY

1) Assemble centre leg as shown.
Remove two bolts from bottom flange of unit side panels that match the hole pattern on the top flanges of both legs. Attach center legs using hardware provided at center divider panel location.
Replace bolts that were removed from side panels to secure leg assembly to bottom flanges of unit side panels.

2) Assemble four corner legs to bottom flanges on unit side panels and end panels using hardware provided, at matching mounting hole patterns.
All legs are the same.

ELECTRICAL WIRING

All wiring and connections to the air cooled fluid cooler must be made in accordance with the National Electrical Code and all local codes and regulations. Any wiring diagrams shown are basic and do not necessarily include electrical components which must be field supplied. (see pages 7,8,10 for typical wiring diagrams).
Refer to the Electrical Specifications table on pages 5, 9 for voltage availability and entering service requirements.

SYSTEM START-UP CHECKS

1. Check the electrical characteristics of all components to be sure they agree with the power supply.
2. Check tightness of all fans and motor mounts.
3. Check tightness of all electrical connections.
4. Upon start-up, check fans for correct rotation. Air is drawn through the condenser coil. To change rotation on 3 phase units reverse any two (2) fan motor leads.
5. All system piping must be thoroughly leak checked before a refrigerant charge is introduced.

MAINTENANCE

A semi annual inspection should be carried out by a qualified refrigeration service mechanic. The main power supply must be disconnected.

1. Check electrical components. Tighten any loose connections.
2. Check control capillary tubes and lines for signs of wear due to excessive vibration or rubbing on metal parts. Secure if necessary.
3. Check tightness of all fans and motor mounts. Remove any deposits which could effect fan balance. Note: Fan motors are permanently lubricated and require only visual inspection.
4. Clean the fluid cooler coil using a soft brush or by flushing with cool water or coil cleansers available through NRP (National Refrigeration Products Inc.)
5. Update service log information (back page of service manual)

HYDRONIC SYSTEM COMPONENTS

PIPING CONSIDERATIONS

1. All piping must comply with local city and plumbing codes.
2. Correct choice of pipe material, diameter, velocity and friction loss (pressure drop) can result in glycol systems running at peak efficiency and performance and hence least cost.
3. Studies have indicated that iron pipes are most susceptible to corrosion, followed by galvanized steel, lead, copper and copper alloys (i.e brass). PVC is generally no-corrosive.
4. Good glycol system design therefore requires that Galvanized Pipe NOT be used and a glycol manufacturer provide the appropriate Corrosion Inhibitor.
5. Parallel, Direct and Reverse Return piping (see illustration on page 19) networks are the most common used as they allow the same temperature fluid to be available to all loads and heat rejection devices (Fluid Coolers). Actual piping should be determined by a qualified hydronic system designer, based on site and design requirements.
6. Isolation Valves should be provided for easy removal of hydronic system components, for repair, maintenance or replacement.
7. All piping should be leak tested after installation.
8. A pressure reducing valve should not be used in a glycol hydronic system.

PUMPING SYSTEM

Pumps

1. Mechanical seal type pumps must be used for glycol systems.
2. Pumps are selected based on Total System Flow and Total Friction Loss (Highest Pressure Drop) through:
    a. The Fluid Cooler
    b. The Load (Chiller, CRAC Unit, etc)
    c. Supply/Return Glycol Piping, Valves & Fittings

   The Sum of the above is the "Total Head" or Pressure Drop of the system, typically measured in ft-H_2O.
3. This is a closed loop system. A counterhead acts on the pump suction so no allowance is required for vertical lift as in an open loop (i.e Open Cooling Tower) system.
4. Many hydronic system designers are specifying and many end-users are purchasing "Pump Packages". These Pump Packages come ready for final pipe and electrical connection, allowing the installer to focus on overall pipe connections.
5. Pumps in Parallel are recommended for standby operation where pump failure may interfere with a critIcal application (i.e Data Center Cooling - N + 1 Design).

PUMPING SYSTEM (cont'd)

Expansion Tanks
As ambient temperature changes so does fluid density. System pressure is maintained within an acceptable range with an Expansion Tank. The expansion tank allows for the expansion and contraction of the glycol due to the temperature change in the closed loop system. Expansion tanks are typically sized based on a percentage of the total system volume.

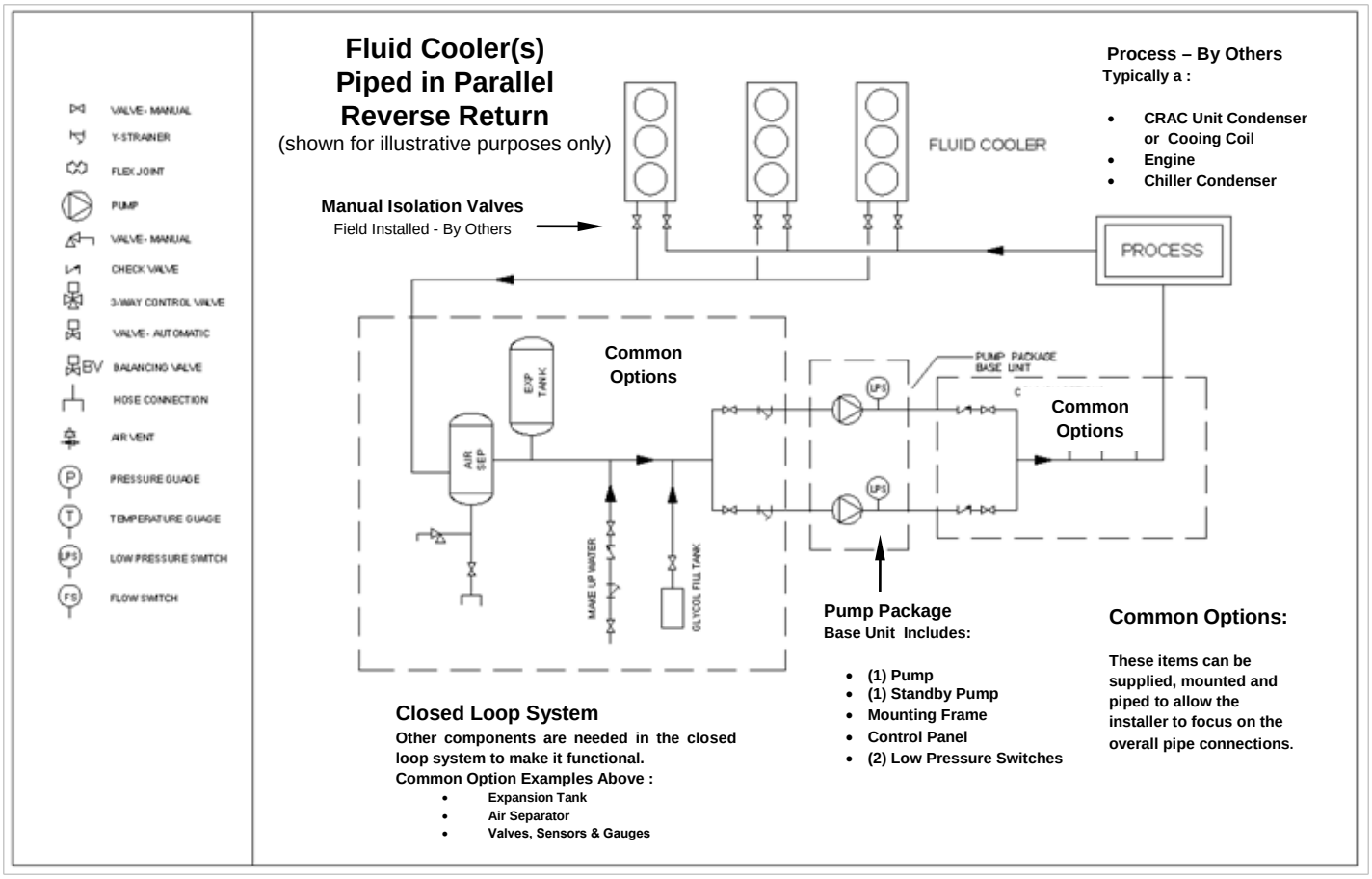
Air Separators
Air Separators are designed to remove entrained air allowing the pumps, valves and heat transfer mediums to operate and transfer energy more efficiently.

Other Common Hydronic System Options
Depending on the complexity of the hydronic system other system components and devices may be specified such as
- Flow, Pressure Gauges and /or Switches
- Isolation and other Valves
- Strainers

Selecting Glycol
Inhibited Propylene or Ethylene Glycol Solutions ranging from 30 to 50 % are the most commonly used. 30 % is the minimum amount for inhibitors to be effective. For freeze protection amounts, see the following guide. (Consult Glycol supplier for most accurate data)

% By Volume	Freeze Point °F *(°C)*	
	Ethylene Glycol	Propylene Glycol
30	5 *(-15)*	9 *(-17.7)*
40	-10 *(-23.3)*	5 *(-15)*
50	-32 *(-35.5)*	-29 *(-33.8)*

Typical Hydronic System Heat Rejection Closed Loop c/w Fluid Coolers



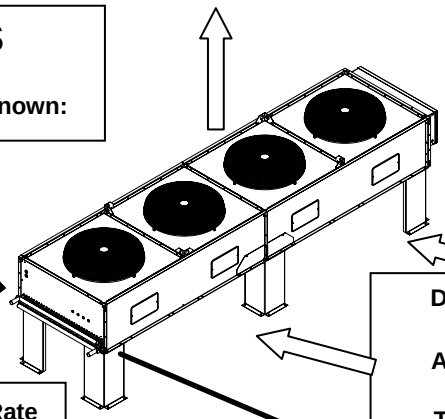
PUMP PACKAGE SELECTION PARAMETERS

FLUID COOLER PARAMETERS

To select a Fluid Cooler the following must be known:

Altitude Above Sea Level
ASL = _____ ft

(Only if 2,000 ft and above)



Entering Fluid Temperature
EFT = ____ °F

Design Ambient Air Temperature At The Fluid Cooler

Tamb = ____ °F

Total Heat of Rejection (THR) Required
_____ Btu/Hr
(Fluid Cooler Capacity)

Fluid Flow Rate
_____ gpm

Leaving Fluid Temperature
LFT = ____ °F

Fluid Type
Ethylene Glycol _____ % or Propylene Glycol _____ %

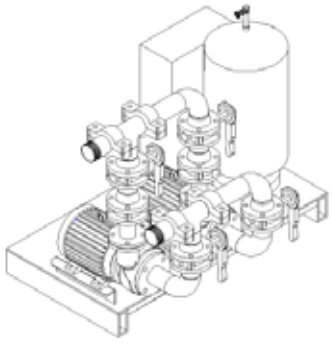
Note: Of EFT, LFT, Fluid Flow and THR - 3 of the 4 Parameters must be known to make a selection

Electrical ____ V / _____ Phase / _____ Hz

PUMP PACKAGE PARAMETERS

To select a Pump Package the following must be known:

Altitude Above Sea Level
ASL = _____ ft
(Only If 1,000 ft and above)



Total System Head
_____ ft-H_2O

=

Highest Fluid Cooler Pressure Drop
____ ft-H_2O

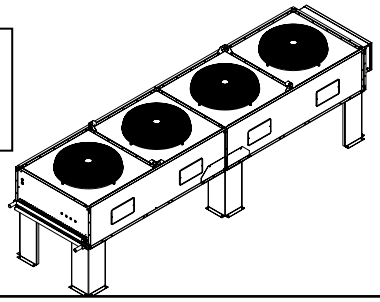
+

Highest Evaporator Unit Heat Exchanger Pressure Drop (i.e Cond. As per below in Chiller)
____ ft H_2O

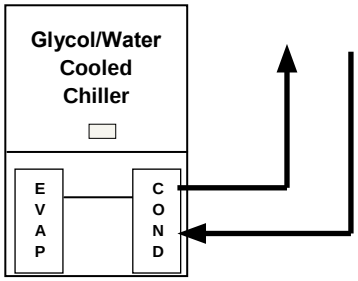
+

Pressure Drop of Supply & Return Glycol Piping + All Valves & Fittings
_____ ft-H_2O

Fluid Flow Rate
_____ gpm



Glycol/Water Cooled Chiller



Electrical ____ V / _____ Phase / _____ Hz

Fluid Type
Ethylene Glycol _____ %
or
Propylene Glycol _____ %

Total System Volume
_____ Gal

=

Internal Volume of Fluid Cooler
_____ Gal

+

Internal Volume of Evaporator Unit Heat Exchanger
_____ Gal

+

Internal Volume of Supply & Return Glycol Piping + All Valves & Fittings
_____ Gal

PARAMETERS FOR SELECTION OF A FLUID COOLER

Fluid Type: □ **Water** □ **Ethylene Glycol / Water**
□ **Propylene Glycol / Water**

Elevation: _____ **Feet Above Sea Level**

Fluid Concentration: _____**%Water** _____**%Glycol**

Air Inlet (ambient temp.) _____ **ºF**

Three of the four following parameters must be specified:

1. Required Capacity _____ **Btu/h** **2. Fluid Inlet Temperature** _____ **ºF**

3. Fluid Flow Rate _____ **GPM** **4. Fluid Outlet Temperature** _____ **ºF**

Other Items To Specify:

1. Voltage (S2 = 208-230/1/60 S4 = 460/1/60 S5 = 575/1/60
T3 = 208-230/3/60 T4 = 460/3/60 T5 = 575/3/60) _____Specify S2,S4, S5,T3,T4 or T5

2. Please Specify (Check Box) Options Required:

- ☐ Control Voltage 240V (Standard)
- ☐ Control Voltage 120V
- ☐ Control Voltage 24V
- ☐ Fan Cycling Ambient Thermostat
- ☐ Fan Cycling Aquastat Thermostat
- ☐ Fan Cycling Control by Others
- ☐ Non-fused disconnect
- ☐ Horizontal air discharge configuration
- ☐ Variable Speed EC Motor
- ☐ Extended leg kits 36”
- ☐ Extended leg kits 48”
- ☐ Gold Coat Fin
- ☐ Copper Fin
- ☐ Heresite Coating
- ☐ 50 Hz

Customer Info:

Name: _____ **Telephone Number:** _____

Fax: _____ **Email:** _____

Fax or email completed sheet to your sales representative.

PROJECT INFORMATION

System	
Model Number	Date of Start-Up
Serial Number	Service Contractor
Refrigerant	Phone
Electrical Supply	Email

PRODUCT SUPPORT RESOURCES

PRODUCT SUPPORT	*web:* **k-rp.com/kfm** *email:* **acc-fc@k-rp.com** *call:* **1-844-893-3222 x526**
TROUBLESHOOTING	*email:* **troubleshooting@k-rp.com** *call:* **1-844-893-3222 x529**
SERVICE PARTS	*web:* **k-rp.com/parts** *email:* **parts@k-rp.com** *call:* **1-844-893-3222 x501**
WARRANTY	*web:* **k-rp.com/warranty** *email:* **warranty@k-rp.com** *call:* **1-844-893-3222 x501**
ORDERS	*email:* **orders@k-rp.com** *call:* **1-844-893-3222 x501**
SHIPPING	*email:* **shipping@k-rp.com** *call:* **1-844-893-3222 x503**

“AS BUILT” SERVICE PARTS LIST

Service Parts List
Label
To Be Attached
HERE

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Due to the manufacturer’s policy of continuous product improvement, we reserve the right to make changes without notice.