AIR COOLED ABSORPTION WATER CHILLER

COOLTEC5™ SERIES

OWNERS MANUAL – INSTALLATION GUIDE

WARNING: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

IF UNIT OVERHEATS OR UNIT'S GAS VALVE FAILS TO SHUT OFF: DO *NOT* SHUT OFF ELECTRICAL SUPPLY TO UNIT. *INSTEAD*, SHUT "OFF" GAS SUPPLY TO UNIT. CALL SERVICE COMPANY.

c UL us

LISTED

ABSORPTION AIR CONDITIONING EQUIPMENT

9TX8

PROPERTY OF OWNER

COOLING TECHNOLOGIES, INCORPORATED
333 14TH STREET – TOLEDO, OHIO 43624 – USA – (419) 536-9006

PRINTED IN U.S.A. EDITION: DECEMBER 2001

PART NUMBER: 101000

SAFETY INFORMATION – OPERATING INSTRUCTIONS

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

1) Do not try to light any appliance.
2) Do not touch any electric switch. Do not use any phone in the building.
3) Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
4) If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to push in or move the gas control lever. Never use tools. If the lever will not push in or move by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

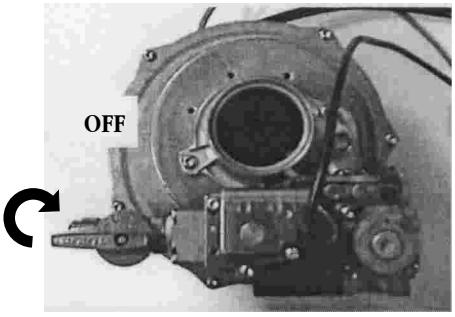
OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.

2. Set the thermostat to the off position, if available. Otherwise: Set the thermostat to its highest setting for cooling.

3. Turn off all electric power to the appliance.

4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.



5. Remove control access panel.

6. Turn gas control knob clockwise to "OFF".

7. Wait five (5) minutes to clear out any gas. If you then smell gas. STOP! Follow "B" in the safety information above this label. If you don't smell gas, go to next step.

8. Turn gas control knob counterclockwise to "ON".

9. Replace control access panel.

10. Turn on all electric power to appliance.

11. Set thermostat to desired setting.

12. If the appliance will not operate, follow the instructions "To Turn Off Gas to Appliance" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to the highest setting. (Cooling Mode).

2. Turn off all electric power to the appliance if service is to be performed.

3. Remove control access panel.

4. Turn gas control knob closkwise to "OFF". Do not force.

5. Replace control access panel.

SAFETY INFORMATION

LIRE AVANT DE METTRE EN MARCHELIRE

<<ADVERTISSEMENT: Quiconque ne respecte pas à la lettre les instructions dans le présent manuel risque de déclencher un incendie ou une explosion entraînant des dommages matériels, des lésions corporelles ou la perte de vies humaines..>>

A. Cet appareil ne comporte pas de veilleuse. Il est muni d'allumage qui allume automatiquement le brûleur. Ne pas tenter d'allumer le brûleur manuellement.

B. AVANT DE LE FAIRE FONCTIONNER, renifler tout autour de l'appareil pour déceler une odeur de gaz. Renifler près du plancher, car certains gaz sont plus lourds que l'air et peuvent s'accumuler au niveau du sol.

QUE FAIRE S'IL Y A UNE ODEUR DE GAZ

1) Ne pas tenter d'allumer l'appareil.

2) Ne toucher aucun interrupteur èlectrique; n'utiliser aucun tèlèphone dans le bâtiment.

3) Appeler immédiatement le fournisseur de gaz en employant le tèlèphone d'un voisin. Respecter à la lettre les instructions du fournisseur de gaz.

4) Si personne ne répond, appeler le service des incendies.

C. Ne pousserr ou tourner la manette d'admission du gaz qu' à la main; ne jamais employer d'outil à cet effet. Si la manette reste coincée, ne pas tenter de la réparer; appeler un technicien qualifié. Quiconque tente de forcer la manette ou de la réparer peut déclencher une explosion ou un incendie.

D. Ne pas se servir de cet appareil s'il a été plongé dans l'eau, complétement ou en partie. Appeler un technicien qualifié pour inspecter l'appareil et remplacer toute parti du systéme de contrôle et toute commmande qui ont été plongés dans l'eau.

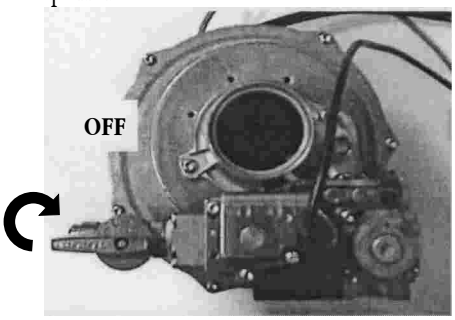
MISE EN MARCHE

1. ARRÊTER! Lisez les instructions de sécurité sur la portion supérieure
(à auche) de cette étiquette.

2. Couper l'alimentation électrique de l'appareil.

3. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

4. Remove control access panel.



5. Turn gas control knob sens horaire to "OFF". Do not force

6. Attendre cing (5) minutes** pour laisser échapper tout le gaz . Renifler tout autour de l'appareil, y compris présdu plancher, pour déceler une odeur de gaz. Si c'est le cas. ARRÊTER! Passer à l'étape B des instructions de cette étiquette, S'il n'y a pas d'odeur de gaz, passer á l'étape suivante.

7. Turn gas control knob sens antihoraire to "ON".

8. Replace control access panel.

9. Mettre l'appareil sous tension.

10. Set thermostat to desired setting.

12. Si l'appareil ne se met pas en marche, suivre les instructions initulées* Comment couper l'admission de gaz de l'appareil* et appealer un technicien qualifié ou le fournisseur de gaz.

COMMENT COUPER L'ADMISSION DE GAZ DE L'APPAREIL

1. Régler le thermostat á la température désirée.

2. Couper l'alimentation électrique de l'appareil s'il faut effectuer des opérations d'entretein.

3. Remove control access panel.

4. Turn gas control knob sens horaire to "OFF". Do not force.

5. Replace control access panel.

Manual Index

Purpose And Scope Of Manual

This manual has been prepared for the owner of this equipment to:

- Summarize the general installation guidelines for the equipment;
- Highlight the maintenance of the system which an owner should perform, and;
- Outline the operating characteristics of the system, so that a qualified technician can be contacted.

Cooling Technologies' chillers are manufactured with great care and attention to quality, and will provide many years of excellent service. This chiller carries a manufacturer's warranty. When service or repairs become necessary, read this warranty thoroughly. Being familiar with the systems operation will help determine if service is required, and what is warranted.

If you have an operating problem or need service, please follow these guidelines:

- Check the operating **Hints & Tips** section of this manual. It may be something simple to correct.
- Call the dealer/contractor who installed the system.
- If not satisfied that the system is performing properly, please contact the manufacturer from the information provided below.

Contact Information

Corporate Offices
COOLING TECHNOLOGIES, INC.
333 14th Street
Toledo, Ohio 43624
(419) 536-9006

Factory & Engineering Facilities
COOLING TECHNOLOGIES, INC.
145 E. Pratt Street
Johnstown, Ohio 43031
(740) 967-3006
Fax: (740) 967-3004

Product Specifications

Unit Performance Specifications:

Nominal Capacity (Tons) at 95° F ARI Standard Conditions	5.0 Tons	(17.6 kw)
Delivered Cooling Capacity (Btu/Hour)	60,100	(17.6 kw)
Nominal Gas Input (Btu/Hour)	89,000	(26.1 kw)
Condenser Air Temperature (entering) by design	95° F	(35° C)
Condenser Air Flow (cfm)	7,000	(200 m^3/min)

Chilled Water Data:

Return Water Temperature	55° F	(12.8° C)
Supply Water Temperature	45° F	(7.2° C)
Chilled Water Flow Rate (gpm)	12.0	(45.4 lpm)
Internal Pressure Drop (feet of water)	20.0	(6.1 m)
Unit Chilled Water Volume (gallons)	2.5	(9.5 liters)
Maximum Vertical Distance (ft) to top of a fan coil, from the base of the chiller	25	(7.6 m)

Electrical Specifications:

Electrical Power Requirements, 60 Hertz, Single-Phase:	208/230 Volts	
Condenser Fan Motor (hp)	1/3 (2)	(0.25 kw ea.)
Refrigerant Circuit Pump (hp)	1/2	(0.37 kw)
Internal Water Pump (hp)	1/3	(0.23 kw)
Total Operating Power (kw)	1.3	
Minimum Circuit Ampacity (MCA):	15	
Electrical Connections, Chiller's Utility Plate, Diameter:	7/8 inch	(2.34 cm)
Size of Time Delay Fuses, Field Supplied/Quantity:	15 Amp / 2 Fuses	

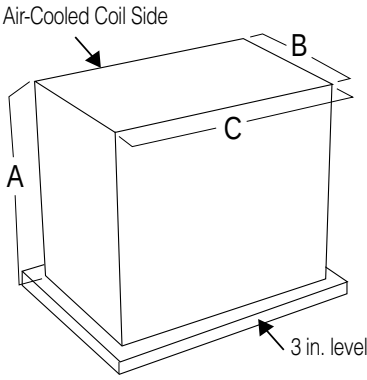
Piping Connections/Physical Data:

Chilled Water Supply, FPT	1 1/4 inch	(3.175 cm)
Chilled Water Return, FPT	1 1/4 inch	(3.175 cm)
Gas Inlet, FPT	1/2 inch	(1.27 cm)
Electrical Knockouts	7/8 inch	(2.22 cm)
Shipping Weight (lbs)	1,100	(500 kg)
Operating Weight (lbs)	1,050	(476 kg)
Overall Height (inches)	57	(1.45 m)
Overall Width (inches)	34	(0.86 m)
Overall Depth (inches)	55	(1.40 m)
Refrigerant Type	R - 717	

Note: *All listed specifications are subject to change and periodic updates by the manufacturer.*

Chiller Dimensions

Figure 1 – Chiller Dimensions



Size:	5 Ton	
A - Height	57 in.	1.45 m
B - Depth	34 in.	0.86 m
C - Width	55 in.	1.40 m

Chiller Clearances

This chiller is gas-fired and air-cooled which requires specific installation clearances for proper operation, and for service/repair accessibility. There **must be a minimum of three** (3) feet (0.9 m) clearance on all four sides of the chiller. Also, the air-cooled coil side of the chiller **must face away from** walls, fences, and any other solid structures (see figure 1).

General Description:

The Cooltec5™ has a self-contained refrigerant system, operated by a natural or propane gas burner, for the cooling of a water circulation system. During normal operation, fans in the chiller discharge operational heat from the cooling cycle and hot flue gases from the burner, therefore, chiller location is very important for good unit operation. The chilled water produced is circulated by a pump to a cooling coil(s) in the building, where a fan circulates indoor air over the coil to cool the conditioned space.

Installation Location

Cooling Technologies' products are gas-fired, air-cooled chillers which are approved for outdoor installation. They must also be installed in an area where there is 100% free air circulation around the equipment.

While chillers are relatively quiet in their operation, they should never be installed in an area where the least amount of noise would interfere with sleeping quarters or neighboring homes.

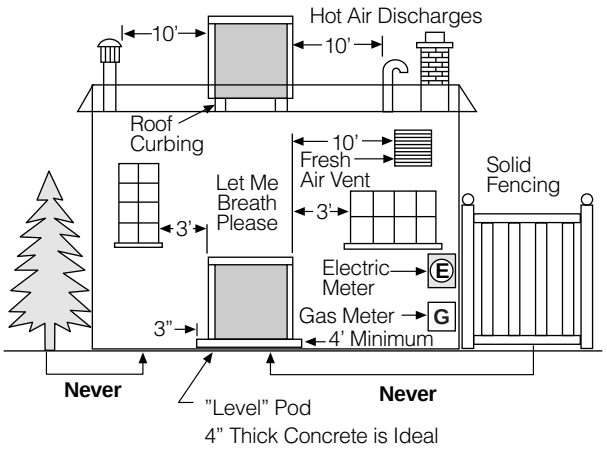
Many homes have external dryer vents, vents from high efficiency furnaces or other types of heat discharging vents. These chillers should never be placed near where vent discharges could be drawn into the chiller and affect operation and performance.

Location And Installation

Absorption chillers:

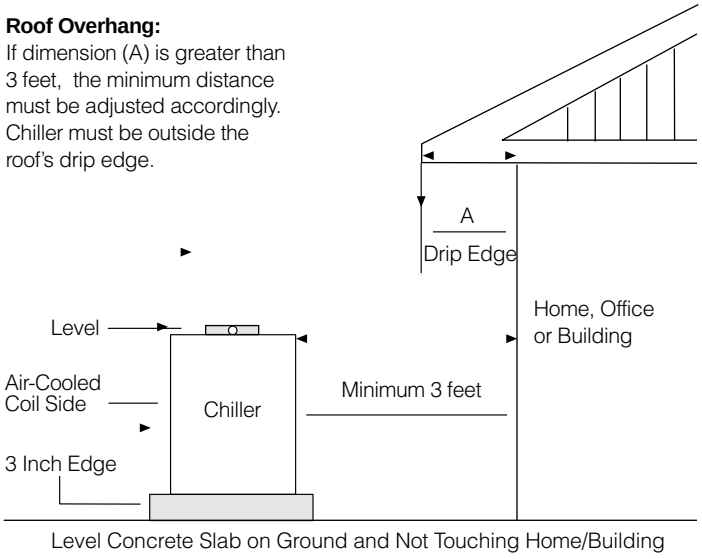
- Must not be installed in a location near fresh air intakes or any other areas where hot discharge products from the chiller may be taken in or blown in by outdoor breezes.

Figure 2 – Air Intakes



- Must be installed level to insure proper operation of the chiller. This can be done using a concrete slab, at least three inches larger than the chiller on all four sides, and approximately four inches thick. It is important that a contractor's level be placed on top of the chiller to verify level installation. This is done side-to-side, and front-to-back (see Figure 3).
- Must not be installed in a location which would allow water run off from a roof to drip directly down on to the equipment. (see Figure 3)

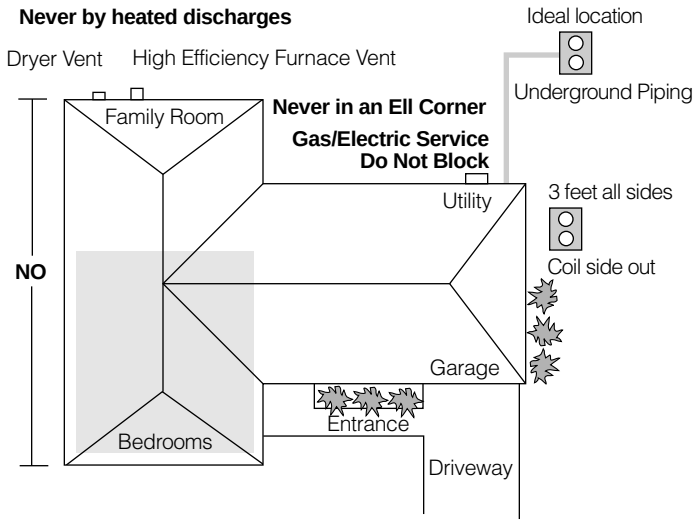
Figure 3 – Roof Overhang



This product is unique in that it chills water, which is circulated into the building by a water pump. This means that these chillers may be remotely located and piping may be run underground to and into the building.

Since these units are easily piped from remote locations, placing the chiller at the edge of the property or next to a garage is often preferred for both appearance and noise (see Figure 4).

Figure 4 – Remote Locations



Every city, township and municipality has specific mechanical code requirements, which must be followed when a contractor installs any piece of air conditioning equipment. It is the responsibility of the installing contractor to get an installation permit and to ensure that all code requirements are followed.

Chilled Water Piping

These units chill water, which is circulated through a cooling coil (s) in the building. Every installed system will have a piping circuit designed for the particular installation. The type of piping used for these chillers is very important for their proper operation. There are two types of chilled water piping, copper or PVC, which can be used. All piping connections will be made at the chiller's utility plate (see Figure 2).

Note: *Ferrous metal piping (steel, iron, and galvanized pipe) must never be used due to the potential for oxidation (rust).*

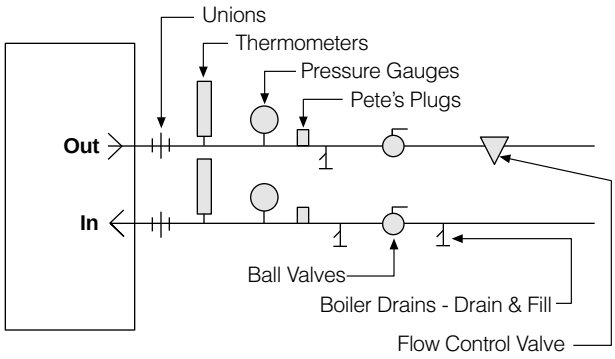
If any portion of a chilled water piping circuit will be shared by a hot water boiler system, that piping, and a minimum of three (3) feet of pipe at the isolation point, must be installed using copper piping.

All piping of the chilled water circuit must be insulated with a minimum of 1/2" (1.27 cm) Armaflex, or equivalent, to prevent condensation.

Typical Piping Connection:

The typical piping connection at the chiller, may include all or some of the following items: thermometers, pressure gauges, Pete's Plugs, unions, ball valves, drain valves, flow control valve and a water/antifreeze filling valve. Pete's Plugs are often used in lieu of thermometers and pressure gauges. It is recommended that at least one (1) pressure gauge be installed in the low-pressure water line for system monitoring (see Figure 5).

Figure 5 – Typical Chiller Piping

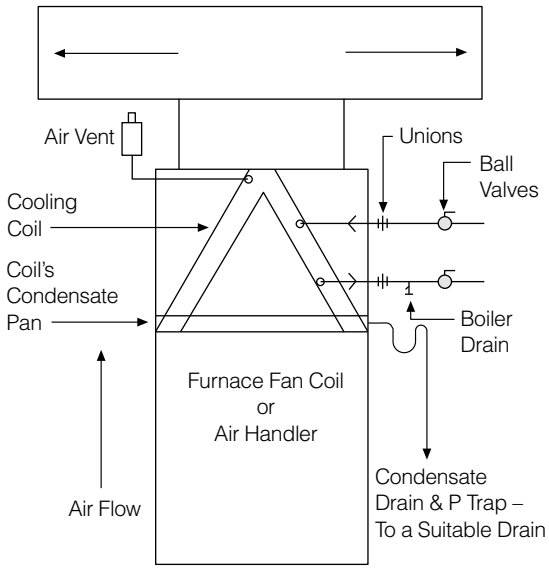


Note: *All water piping circuits require an air vent installed at the highest point of the piping system. For some installations, the chiller may be the highest point. Although the chiller comes with an air-bleed valve at the evaporator, in this instance an in-line air separator must be used in the circuit and connected to an air vent.*

Indoor Fan Coil (Air Handler)

Every installation must have at least one chilled water coil, and may have more. The coil(s) may be adapted to an existing furnace/blower system, located in a fan coil unit(s), or they may be in individual air handlers, which are used on larger systems. Adapting the piping to the coil(s), means consulting the coil manufacturer's data for correct connection.

Figure 6 – Typical Coil Connection



The coil's piping should have a minimum of one (1) ball valve per supply/return line, unions, and a boiler drain for service and repair. A condensate drain, including a P-trap, must be run to a suitable drain or condensate pumping system. Depending upon the geographic area, it may be desirable to insulate the condensate drain also. If the cooling coil is the highest point of the piping system, an air vent must be adapted to the coil (see Figure 6).

Note: *If the cooling coil is adapted to a furnace, and PVC piping is used, the PVC piping must not be connected directly to the coil. A minimum of three feet (0.91 m) of copper pipe must be used at the coil and then be connected to the PVC. Operational furnace heat can affect the PVC.*

Pipe Sizing & Water Pumping:

Single chiller installations, being adapted to one (1) or two (2) coils, and having a total piping run of 200 feet or less, are normally handled properly by the water pump included in the chiller. The pipe size for these applications is 1 1/4 inch (3.175cm).

These chillers are very flexible for custom installations. If you have a unique application, please contact the manufacturer for information about many special applied systems.

Filling The Water System

Note: *Prior to connecting the piping to the chiller and filling the water system, the field installed piping system* ***must be*** *flushed out, cleaned, and pressure checked for leaks. After flushing and pressure checking the piping circuit(s), the chiller may then be connected and the system is ready for filling.*

Filling of the water system requires the following pieces of information:

1) The amount of distilled water required to fill the system.
2) The amount of antifreeze required for a minimum 20% concentration.
3) The amount of antifreeze required for total freeze protection in cold weather climates.
4) How and where to put the water/antifreeze mixture into the system.

Determining System Volume:

Equipment and coil manufacturers will provide liquid volume requirements for their products. Piping manufacturers provide a chart listing specific liquid volumes for various sizes of piping. By using these volume figures, one can determine a total system's liquid volume. Below, is an example of a coil volume chart.

Coil Type	Coil Size	Volume
A-Coil	1.5 Ton	0.8 gallon
A-Coil	2.0 Ton	0.9 gallon
A-Coil	3.0 Ton	1.0 gallon
A-Coil	4.0 Ton	1.5 gallons
A-Coil	5.0 Ton	2.0 gallons

A full pipe volume chart is available from the manufacturer for use with large and/or custom designed systems. Typical single-chiller systems will use 1 1/4 inch (3.175cm) pipe with a volume of 0.07 gallon per linear foot, or approximately 7.0 gallons per 100 foot of pipe.

As listed in the manufacturer's specifications (page 5 of this manual) the Cooltec5 volume is approximately 2.5 gallons (9.5 liters).

Note: *Distilled Water MUST be used.*

Antifreeze Requirements

All installed systems **must have** a minimum of 20% antifreeze added to protect the normal operation of the chiller's cooling system. Equipment installed in areas subject to colder winter weather conditions must increase the antifreeze percentage to protect the system from totally freezing.

Only good quality, inhibited antifreeze can be used in these systems. Depending on the application, the manufacturer recommends Dowtherm® (ethylene glycol), or Dowfrost® (propylene glycol), or their chemical equivalent.

Note: *Automotive type antifreeze must not be used in this equipment.*

The chart below outlines concentration percentages and freeze factors for these two products.

Dowfrost®

Freezing Point (°F)	Freezing Point (°C)	Volume % Freeze Protection	Volume % Burst Protection
20	-6.7	18 %	12 %
10	-12.2	29 %	20 %
0	-17.8	36 %	24 %
-10	-23.3	42 %	28 %

Dowtherm®

Freezing Point (°F)	Freezing Point (°C)	Volume % Freeze Protection	Volume % Burst Protection
20	-6.7	16 %	11 %
10	-12.2	25 %	17 %
0	-17.8	33 %	22 %
-10	-23.3	39 %	26 %

Example: For a total system volume of ten (10 gallons): The manufacturer's minimum of 20 % = 2.0 gallons anti-freeze and 8 gallons distilled water. To protect the system to -10 F (–23.3 C) with Dowfrost® would require 4.2 gallons of antifreeze and 5.8 gallons of distilled water.

How & Where to Fill:

Once the piping system has been flushed, leak checked, and connected to the chiller, the following procedure will be used to fill the system with its proper mixture of distilled water and antifreeze.

1 A container to mix the distilled water and antifreeze and a pump is required to move this mixture into the system.

2 A hose from the pump will be connected to a boiler drain in the piping near the chiller (see Figure 5). In one of the chiller's connecting lines, there is a ball valve with a boiler drain on either side. With the ball valve closed, the mixture will be pumped into the system at one boiler drain, and the other boiler drain will be used to purge air from the system.

Finalizing System Filling

The mixture pumping and filling procedure should be continued to the point where there is a constant and continuing flow of the mixture returning to the container, with all air purged from the system. Shut off the purging drain valve and build pressure on the system until the pressure gauges read ten (10.0) psig . Shut off the pump and the filling drain valve. The chiller system is now ready to be started.

Note: *There is a manual air bleed located in the chiller on top of the evaporator tower. This bleeder should be opened a little to insure that all air has been removed from the evaporator prior to chiller operation. Once the system is operating, the automatic air vent in the system will handle all further air removal.*

As the chiller system operates and the system's liquid mixture is cooled down, the pressure reading at the pressure gauges will start to drop. When the cooling fluid's temperature has dropped to normal operating temperature (45° F / 7.2° C), the pressure reading on the inlet pressure gauge should read no lower than 5.0 psig. If it drops lower than this figure, then follow normal filling procedures and add more fluid to increase this gauge's pressure reading.

These chilled water circuits are designed to operate under a positive pressure. By installing a pressure gauge in the inlet line, the circuit pressure can always be monitored to insure proper operation. Call a qualified service technician to check out a low pressure condition.

Setting System's Flow Rate

Once the system is operating, the proper system flow rate must be set. This is done by using the flow control valve, and by reading a pressure differential between two (2) pressure gauges installed in the inlet and outlet lines at the chiller (see Figure 5). The normal per chiller flow rate is 12.0 gpm (45.4 lpm). When the water pump in the chiller operates, it produces a higher reading on the outlet line's pressure gauge. The pressure difference between the inlet and outlet gauges provides a pressure drop reading. Flow rate values are calculated by using this pressure drop differential. A proper flow rate through the chiller will provide a 10.5 psig (71 kPa) pressure drop differential. If the system was installed properly, the initial pressure drop reading will be greater than this value. By closing down the flow control valve a little at a time, the pressure differential will start decreasing. When the value reaches 10.5 psig (71 kPa), the chiller's flow rate is set and correct.

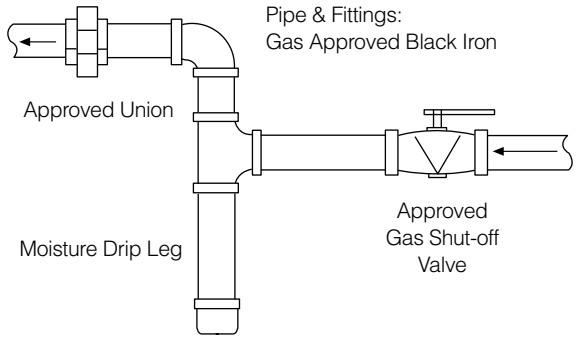
Chiller's Gas Piping

All natural gas piping must be installed in adherence to all local, city, township and municipal codes. All gas piping shall be the black iron pipe designed for gas, and any underground gas piping shall be underground copper piping designed for gas.

All gas piping connections are made at the chiller's utility plate at the chiller. A typical gas piping connection at the chiller should have the following: service union, moisture drip leg, and an approved gas shut off valve (see Figure 7).

Note: *All newly installed gas piping systems must be cleaned, pressurized, and leak checked. This procedure* ***must not be performed*** *with the gas piping connected to the chiller. Doing so will cause damage to the chiller's gas valve. All gas piping must be blown out for debris and moisture, leak/pressure checked, and then connected to the chiller.*

Figure 7 – Typical Gas Piping Connection



Propane Gas Operation

The chillers may be operated using propane gas instead of natural gas. Propane operated units have slightly different installation and operational requirements and the chiller's manufacturer should be consulted for all propane applications.

Adjusting Gas System Controls:

The primary operating energy for these chillers comes from natural or propane gas. Because the gas input setting controls the cooling system operation and performance, each chiller must be checked for a proper setting at start-up. Only qualified technicians should perform this procedure.

Main Electrical Power

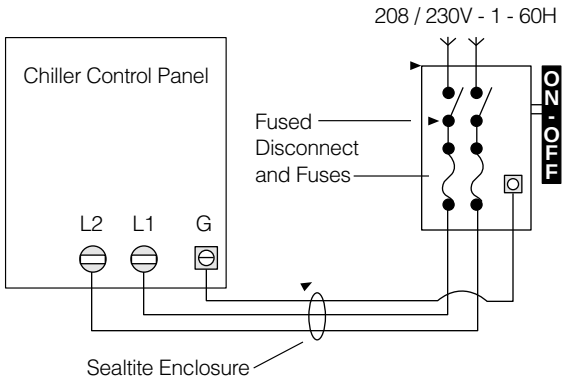
All electrical wiring and circuits shall be installed in accordance with the National Electrical Code and shall adhere to all local, city, township and municipal codes.

These chillers are designed to operate using single-phase, 208/230volt power at 60 hertz. Electric power requirements are small because natural or propane gas provides the primary operational energy.

The chiller's operation is controlled by electronic and electro-mechanical devices, and it must be grounded so that these components function properly. Therefore, along with the two (2) wire 208/230 volt service, a third safety ground wire **must be** brought to the chiller's control panel and be connected to the designated location.

Typical electrical service connections (see Figure-8) are made through the chiller's utility plate. There must be a fused disconnect installed near the chiller for service and repair shut off and main line overload protection. The fused disconnect shall be sized for a minimum circuit ampacity of 15 Amps, with two (2) 15 amp fuses installed in the disconnect. These field supplied fuses must be time delay type fuses.

Figure 8 – Typical Electrical Connection



Thermostat And Location

All thermostats are not equal. The thermostat purchased for this system must be designed for gas-fired chillers. Location of the thermostat in the building is important for the proper operation of the equipment and for proper cooling of the conditioned area.

DONOT locate a thermostat on an outside wall.
DONOT locate a thermostat near a supply grille.
DONOT locate a thermostat near a heat or cold source that could affect sensing a true indoor temperature.

DO locate the thermostat on an interior wall, approximately 48-54 inches above floor level.

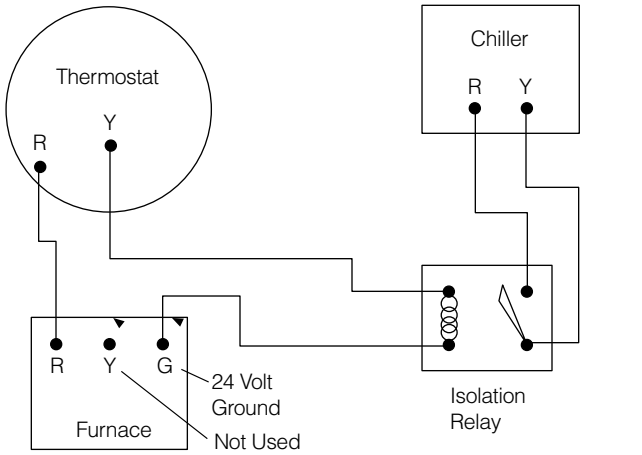
Thermostat Wiring and Connection:

The thermostat's wiring circuit uses a 24-volt power source provided by a transformer in the chiller's control panel. The chiller and the thermostat, use the same labeled wiring code, R - power from chiller to the thermostat's R and Y - power from the thermostat back to the chiller's Y. The chiller's control panel and the thermostat's connection terminals are labeled as such (R and Y). All thermostat wiring must be 18 gauge wire or larger.

Furnace/Chiller Application

If a chiller is being adapted to a new furnace system or an existing furnace, the furnace and the chiller will both have 24-volt supply transformers. **These supply sources cannot be connected together!** It will be necessary to install an isolation relay to separate the two power sources and to control the chiller's operation (see Figure - 9). Now, the furnace's transformer will supply power to and through the thermostat, and the thermostat's (Y) circuit will energize the isolation relay.

Figure 9 – Isolating Transformers



General Operation Description

The chiller system is now completely installed and is ready for operation. For normal system operation, the chiller will function by using the indoor thermostat to turn the system on and off to maintain a desired indoor temperature. The system automatically controls to the temperature setpoint when the thermostat's system switch is placed in the "Cooling" position.

Typical Operating Sequence:

The chiller or furnace's transformer supplies power to the thermostat (R circuit). With the thermostat's system switch in the cooling position, and with the thermostat set for the desired indoor temperature, the thermostat's R contact closes to make contact with the thermostat's Y circuit. This sends power to energize the chiller's Y terminal, which starts the chiller. The thermostat will also energize the blower system in the building to circulate the indoor air to be cooled. When the conditioned space is cooled to the desired temperature, the R-Y circuit is opened, the chiller and blower will continue running for a short period, and then shut off. As long as the thermostat is set in the cooling mode, the thermostat will automatically cycle the system on and off to maintain the indoor temperature and comfort level desired.

Special Note: *If the system has an isolation relay, the thermostat will energize the isolation relay, and the relay's contacts will energize the chiller.*

Flue Cap Assembly

The chiller is supplied with a flue cap, which the installing contractor will secure in place when the chiller is installed. This cap protects the chiller from rain entering the gas-fired burner's exhaust port. This flue cap will get hot during chiller operation and should not be touched. If there is damage to the flue cap, or if it is missing, please contact your dealer immediately to have a new flue cap installed.

CONGRATULATIONS

Your system is up and running. It will provide you with many years of great comfort, excellent efficiency and the savings that only a gas-fired chiller can offer.

You have made an investment in one of the most efficient and cost effective cooling systems on the market. To protect your investment there are minimal maintenance requirements. Also, there are several things which you can do to keep the entire system operating efficiently (see Operating Tips).

System Maintenance

The chiller system has minimal maintenance requirements. Keep it clean and looking like new. Cleanliness is important to a successful preventative maintenance program.

Chiller: The chiller has an air-cooled coil on one side. Keeping this coil section clean is high on the maintenance priority list. Cottonwood fuzz and other air born contaminants can collect on the face of this coil section. Frequent cleaning will maintain proper operation. Simply brush it off or wash down with a garden hose (Wash at an angle, from the top down). **NEVER**, cut the lawn so that grass clippings are blown into this coil section. **KEEP** the area around the chiller clean and free from debris.

Furnace/Blower System: All furnaces, fan coils and air handlers have filters in them for removing air born particles from the indoor circulated air. Changing these filters often is another key preventative maintenance item, and it keeps the system's performance at it's best. It is recommended that filters should be changed a minimum of three times per year.

Condensate Drains: During cooling operation, moisture in the air condenses on the cooling coil and is drained out through the condensate drain (see Figure-6). It is a good practice to check the condensate drain circuit to ensure proper operation.

General Checks: When your system is installed, take the time to learn a little about it's general operation. During the operational cooling season, inspect the system from chiller to air handler. Look for possible leaks, look for anything out of the ordinary, and listen for noises which seem abnormal or different. Addressing these items early can save on down time and potential costly repairs.

Save & Win: A little time to make these simple maintenance checks will keep your system operational and it will keep you happy.

Operating Tips

As important as maintenance is, here are a few other things which can be done to keep the system operating properly and efficiently.

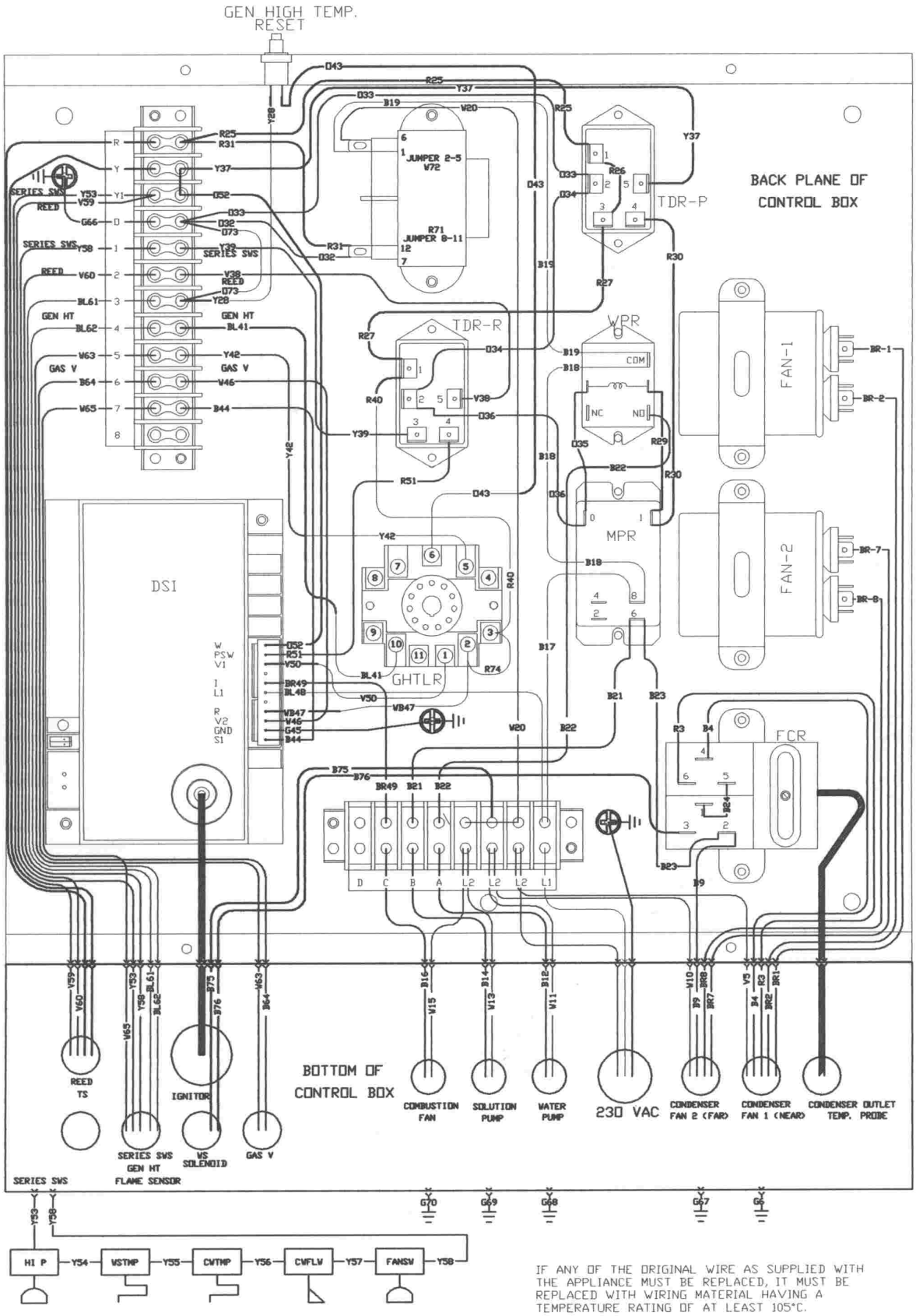
1. The thermostat is not an accelerator. Setting it really low does not increase cooling performance.
2. The lower you set the thermostat, the more it costs to operate the system. Experiment with temperature settings from 75 to 78 degrees.
3. If your not going to be in the building for a while, set the thermostat up a few degrees and save. Do not shut the system off. This allows the building to completely heat up and requires more energy to recover the setpoint temperature.
4. Keep shades down or curtains drawn when not home or in rooms not being used. Sun infiltration increases cooling load and operating costs.
5. Take note of furniture placement. Note that for every air supply grille or return air grille which may be blocked, operating costs go up and system efficiencies go down.
6. If you're having company or a party, turn down the thermostat a little before they arrive. All will be more comfortable.
7. Make sure all indoor heating and vented devices (e.g. clothes dryer) are properly venting the heat out of the building.
8. If the system does not seem to be performing adequately, check the obvious and then call for service.

Before You Call:
Make these following checks to save time and a service charge.

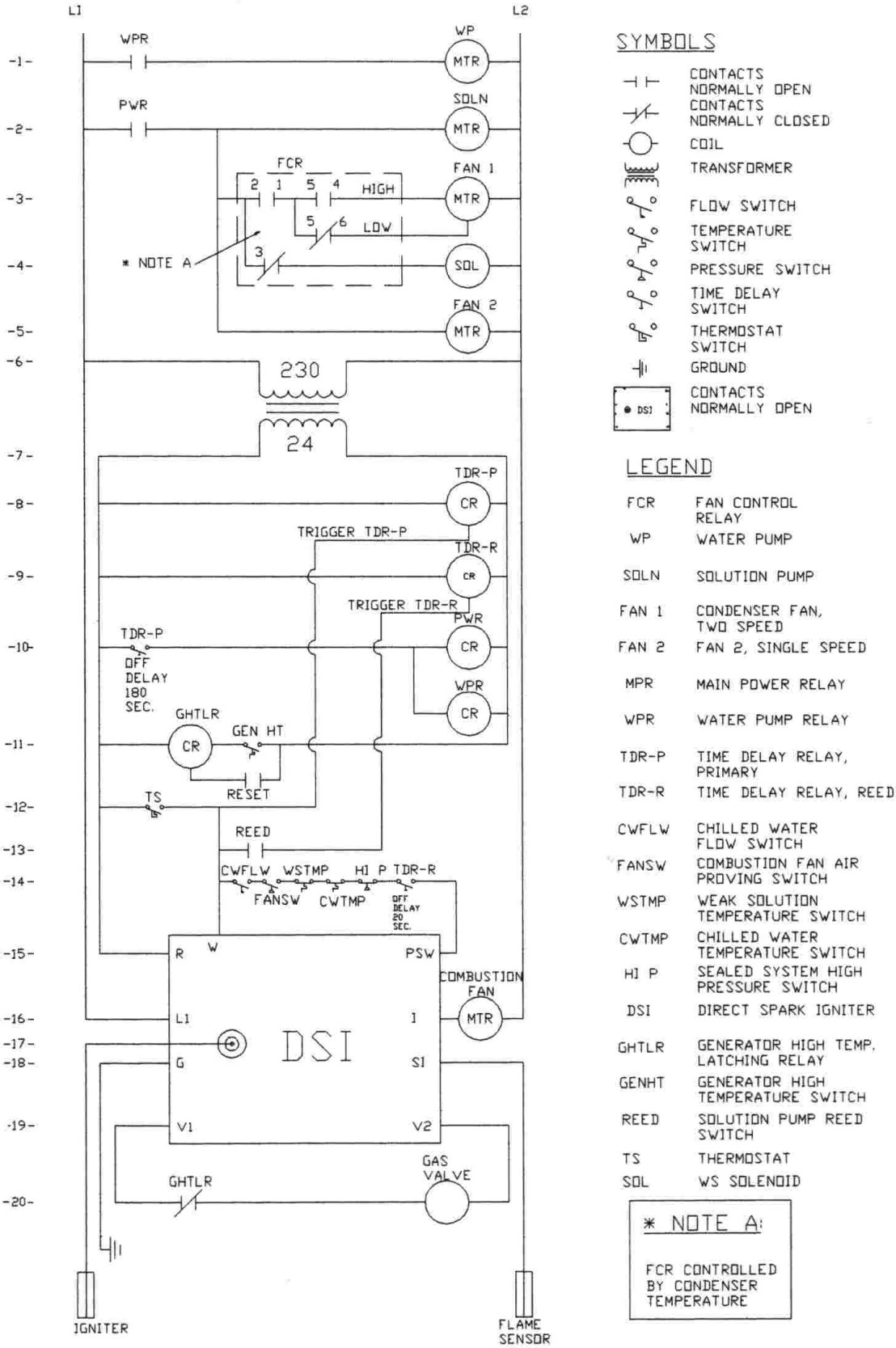
9. Check thermostat for proper settings.
10. Check all electrical switches, breakers and fuses.
11. Check filters for cleanliness.
12. Double check maintenance items and all operating tips.

The last page of this manual provides an installation record sheet for your system. Please fill it out and keep as a reference for your system. Good records will help for maintenance and service.

Wiring Diagram - No. 1



Wiring Diagram - No. 2



Electrical Diagrams - Controls - Definitions

CWFL: Chilled Water Flow Switch - NO - closes with 3gpm of water flow. Protects evaporator from freezing up due to lack of chilled water flow.

FANSW: Combustion Fan Air Proving Switch - NO - closes with 0.6" H2O pressure drop across combustion fan outlet orifice plate. Prevents gas valve from opening without combustion air available.

WSTMP: Weak Solution Temperature Switch - NC - opens on rise of weak solution temperature past 320°F, closes on fall at 240°F. Protects generator from overheating during solution store out condition.

CWTMP: Chilled Water Temperature Switch - NC - opens on temperature fall at 41°F, closes on rise at 44.5°F. Protects evaporator from freezing.

HI P: Sealed System High Pressure Switch - NC - opens on pressure rise at 400 psig, and must be manually reset.

Reed: Solution Pump Reed Switch - NO - closes when magnet on solution pump sheave passes by stationary reed switch. Feeds Time Delay Relay with 20 second delay. Protects generator from overheating due to broken belt or failed motor.

GEN HT: Generator High Temperature Switch - NC - opens on rise at 365°F, closes on fall at 285°F. Snap switch butted up to fire tube OD. Protects generator from overheating. Feeds Latching Relay that must be manually reset using NO push button switch or removing power from chiller.

GAS V: Gas Valve located on combustion fan assembly. Turns gas on to main burner and pilot igniter.

Igniter: Spark type intermittent pilot igniter. Lights main burner on call for cooling.

Flame Sensor: Detects presence of main burner flame.

Fan CNTRL Relay: Controls the speed of Condenser Fan # 1, due to condenser outlet Temperature; OFF, LOW, HIGH.

COMB FAN: Combustion Fan
SOLN Pump: Solution Pump
Water Pump: Chilled Water Pump

Fan 2: Condenser Fan, Single Speed
Fan 1: Condenser Fan, Two Speed
NO = Normally Open
NC = Normally Closed

Control System's Operational Logic

For cooling, Thermostat closes, closing primary Time Delay Relay (TDR-P), which closes the main power and water pump relays (MPR, WPR), and sends power to the TH/W pin on the Direct Spark Ignition controller (DSI). Closing of MPR starts the Solution Pump and Condenser Fans. Closing of WPR starts the Water Pump. A relay inside the DSI closes and starts the Combustion Fan. The DSI then looks for power at pin PSW, which requires that safety switches - CWFLOW, FANSW, WSTMP, CWTMP, HI P and the Reed Switch Time Delay Relay (TDR-R) be closed. If all safety switches are closed, a relay in the DSI closes to open the gas valve and activate the spark igniter. Power to the gas valve passes through the Generator High Temperature Switch Latching Relay (GHTLR), which must be manually reset if the NC Generator High Temperature Switch opens on overheat. If the GHTLR is closed, the gas valve opens and the spark igniter attempts to light the pilot and main burner for four seconds, while watching for flame confirmation from the flame sensor. If flame is not established, the DSI will try to ignite the burner two more times before locking out. Cycling the Thermostat OFF/ON will reset the DSI for three more tries.

Once a flame is established, the gas valve will remain on until the Thermostat drops out or one of the safety switches opens. If the Thermostat opens, the DSI will close the gas valve and shut down the Combustion Fan. The condenser Fans, Solution Pump, and the Water Pump will continue to run until TDR-P kicks out after a three minute cool down period.

If one of the safety switches (other than the Generator High Temperature) opens while the chiller is operating, power to the PSW pin on the DSI will drop and the DSI will close the gas valve and wait until power to the PSW returns (the safety switch closes or is reset). If the Generator High Temperature Switch opens during operation of the chiller, the GHTLR will open, dropping the power to the gas valve, and shutting off the burner. The DSI will detect a loss of flame and try to relight the burner three times before locking out. The GHTLR will remain open until the manual reset button is depressed, or power to the chiller is momentarily removed. Condenser Fan 2 is a single speed fan and is on whenever MPR is closed. Condenser Fan 1 is a 2-speed fan, which can be OFF, LOW, or HIGH, depending upon the status of the Fan Control Relay, which is monitoring Condenser outlet temperature.

Installation Record Form

Your new Cooltec Chiller, has been produced with great care and pride, and it has been installed by a trained and qualified contractor. Your new system will provide you with many years of efficient and comfortable cooling. In the event that you need to call for service, having an complete record of your system information, will be a great asset for all parties.

Chiller Model: _____

Serial number: _____

Purchase Date: _____

Installation Date: _____

Start up Date: _____
(please indicate: month/day/year)

Customer Name: _____

Street Address: _____

City/State/Zip: _____

Phone/Fax: _____

Email: _____

Installing Company: _____

Street Address: _____

City/State/Zip: _____

Phone/Fax: _____

Email: _____

Contact name: _____

Satisfaction Comments:

_____

_____

_____

Would you refer this company: ☐ Yes ☐ No

Notes:

_____

_____

_____

Installation Information

Clearances: (see page 6)

Air-Cooled Coil Position: ☐ front ☐ back ☐ left end ☐ right end (in inches)

Is the chiller outside of roof overhang ☐ Yes ☐ No

Is the chiller in free air circulation area? ☐ Yes ☐ No

Are there any trees, shrubs or fences blocking chiller? ☐ Yes ☐ No

Chilled Water Piping: (see page 6)

Pipe Size: _____

Physical Looks: _____

Pressure & Leak Checked: ☐ Yes ☐ No

Flushed & Cleaned Out: ☐ Yes ☐ No

Insulated: ☐ Yes ☐ No

Supported Properly: ☐ Yes ☐ No

Chiller Adjustments – Leveling (see page 7)

Side to Side: _____

Front to Back: _____

Chiller Support Slab Type: _____

Furnace/Fan Coil (see page 8)

No. of Coils: _____

No. of Thermostats: _____

Filter Size(s): _____

System Size (tons): _____

Air Flow (cfm): _____

Good System Air Flow: ☐ Yes ☐ No

Clean Filters: ☐ Yes ☐ No

Condensate System Installed: ☐ Yes ☐ No

Gas Piping (see page 10)

Pressure & Leak Checked: ☐ Yes ☐ No

Supported Properly: ☐ Yes ☐ No

Physical Looks: _____

Type of Gas: _____

Antifreeze (see page 10)

System Fluid Volume:

Distilled Water Used:

Antifreeze Type:

Antifreeze Volume(%):

Electrical (see page 11)

Chiller Voltage: _____

Disconnect by Chiller: _____

Fuses in Disconnect: _____

Fuse Size: _____

Ground Wire Installed: _____

Physical Condition: _____

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